

**Application to the
Minnesota Public Utilities Commission
for a Site Permit for a Large Wind Energy
Conversion System**

Lake Benton Wind II Repowering Project
Pipestone County, Minnesota

MPUC Docket Number: IP-6903/WS-18-179

May 3, 2018

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ACRONYM/TERM	DEFINITION
AADT	Average Annual Daily Traffic
AGL	Above Ground Level
ABPP	Avian Bat Protection Plan
AC	Alternating Current
ACSR	Aluminum Conductor Steel Reinforced
ANSI	American National Standards Institute
ASR	Antenna Structure Registration
Applicant or Lake Benton Wind II	Lake Benton Wind II, LLC
ASTM	American Society for Testing and Materials
BMPs	Best Management Practices; prevents soil erosion and sedimentation
Capacity	The capability of a system, circuit, or device for storing electronic charge
Phase Ia	Cultural Resources Literature Search – a large-scale review and compilation of known cultural resource data.
Phase I	Cultural Resources Reconnaissance Survey – physical inspection and identification of cultural resources within a specific area.
CON	Certificate of Need
CNHS	Community Noise and Health Study
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
dB	Decibels
DBS	Direct Broadcast Satellite
Distribution	Relatively low-voltage lines that deliver electricity to the retail customer's home or business
DNHs	Determinations of No Hazard

ACRONYM/TERM	DEFINITION
EF	Electric Fields
ELF	Extremely Low Frequencies
EMF	Electric and Magnetic Field
EWG	Exempt Wholesale Generator
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FPPA	Farmland Protection Policy Act
GE	General Electric
Generator	A machine by which mechanical energy is changed into electrical energy
GSU	Generator Step Up
Geotechnical	A science that deals with the application of geology to engineering
Hub	The central component of the wind turbine which connects the rotors to the generator.
Hz	Hertz
IEEE	Institute of Electrical and Electronic Engineers, Inc.
Interconnection	Location of project connection to the power grid.
IRAC	Interdepartment Radio Advisory Committee
kV	kilovolt
kV/m	Kilovolt per meter
kW	kilowatt
Leq	Equivalent Sound Level
LGU	Local Government Unit

ACRONYM/TERM	DEFINITION
LHVTL	Large High Voltage Transmission Line
LNTE	Low Noise Trailing Edge
LWECS	Large Wind Energy Conversion System
MBS	Minnesota Biological Survey
MERRA2	Modern-Era Retrospective Analysis for Research and Applications
MET	Meteorological Towers
MF	Magnetic Field
MG	MilliGauss
Micrositing	The process in which the wind resources, potential environmentally sensitive areas, soil conditions, and other site factors, as identified by local, state and federal agencies, are evaluated to locate wind turbines and associated facilities.
MISO	Midcontinent Independent Transmission System Operator
MN/DOT	Minnesota Department of Transportation
MMPA	Minnesota Municipal Power Authority
MPCA	Minnesota Pollution Control Agency
Commission	Minnesota Public Utilities Commission
MPH	Miles Per Hour
MSL	Mean Sea Level
MW	megawatt
Nacelle	A streamlined enclosure (as for an engine), which houses the gearbox, generator, brake, cooling system and other electrical and mechanical systems
NASA	National Aeronautics and Space Administration
NEC	National Electric Code

ACRONYM/TERM	DEFINITION
NEMA	National Electrical Manufacturers Association
NESC	National Electric Safety Code
NHIS	Natural Heritage Inventory System
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resource Conservation Service
NRHP	National Register of Historic Places
NSP	Northern States Power Company
NTIA	National Telecommunications and Information Administration
NWI	National Wetlands Inventory
O & M	Operations and maintenance facility
OPGW	Optical Ground Wire
OSA	Office of State Archaeologist
OSHA	Occupational Safety and Health Administration
POI	Point of Interconnection
PPA	Power Purchase Agreement
Project	Lake Benton Wind II Project
PTC	Production Tax Credit
PWI	Public Waters Inventory
RES	Renewable Energy Standard
RIM	Reinvest in Minnesota
Rotor	The rotor consists of three blades mounted to a rotor hub
RD	Rotor Diameter: Diameter of the rotor from the tip of a single blade to the tip of the opposite blade

ACRONYM/TERM	DEFINITION
RERL	Renewable Energy Research Laboratory
ROW	Right-of-Way
SCADA	Supervisory Control and Data Acquisitions (communications technology)
SCS	Site Characterization Study
SHPO	Minnesota State Historic Preservation Office
SME	Subject Matter Expert
SMMPA	Southern Minnesota Municipal Power Agency
SNA	Scientific and Natural Area
SPCC	Spill Prevention, Control, and Countermeasure Plan
Step-up Transformer	A transformer that increases voltage
Stray Voltage	A voltage resulting from the normal delivery and/or use of electricity (usually smaller than 10 volts) that may be present between two conductive surfaces that can be simultaneously contacted by members of the general public and/or their animals
SWPPP	Storm Water Pollution Prevention Plan
TNW	Traditional Navigable Water
TV	Television
USACE	US Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
V	Volt
WCA	Wetland Conservation Act
WCFZ	Worst Case Fresnel Zone
Windlogics	Windlogics, Inc.
WMA	Wildlife Management Area

ACRONYM/TERM	DEFINITION
WNS	White Noise Syndrome
WOUS	Waters of the U.S.
WPA	Waterfowl Protection Area
WRP	Wetlands Reserve Program
Yaw	To deviate erratically from a course (as when struck by a heavy sea); especially to move from side to side: to turn by angular motion about the vertical axis
ZVRT	Zero Voltage Ride Through

Minnesota Rule	Required Information	Application Section(s)
7854.0500	SITE PERMIT APPLICATION CONTENTS	
Subpart 1	<u>Applicant</u>	
(A)	A letter of transmittal signed by an authorized representative or agent of the applicant	Under separate cover
(B)	The complete name, address, and telephone number of the applicant and any authorized representative	1.0
(C)	The signature of the preparer of the application if prepared by an agent or consultant of the applicant	Under separate cover
(D)	The role of the permit applicant in the construction and operation of the LWECS	1.0
(E)	The identity of any other LWECS located in Minnesota in which the applicant, or a principal of the applicant, has an ownership or other financial interest	1.0
(F)	The operator of the LWECS if different from the applicant	1.0
(G)	The name of the person or persons to be the permittees if a site permit is issued	1.0
Subpart 2	<u>Certificate Of Need Or Other Commitment</u>	
(A)	The applicant shall state in the application whether a certificate of need for the system is required from the commission and, if so, the anticipated schedule for obtaining the certificate of need. The commission shall not issue a site permit for an LWECS for which a certificate of need is required until the applicant obtains the certificate, although the commission may process the application while the certificate of need request is pending before the commission.	2.0
(B)	The commission may determine if a certificate of need is required for a particular LWECS for which the commission has received a site permit application	2.0

Minnesota Rule	Required Information	Application Section(s)
(C)	If a certificate of need is not required from the commission, the applicant shall include with the application a discussion of what the applicant intends to do with the power that is generated. If the applicant has a power purchase agreement or some other enforceable mechanism for sale of the power to be generated by the LWECS, the applicant shall, upon the request of the commission, provide the commission with a copy of the document.	2.0
Subpart 3	State policy. The applicant shall describe in the application how the proposed LWECS project furthers state policy to site such projects in an orderly manner compatible with environmental preservation, sustainable development, and the efficient use of resources.	3.0
Subpart 4	<u>Proposed Site</u>	
(A)	The boundaries of the site proposed for the LWECS, which must be delineated on a United States Geological Survey Map or other map as appropriate	4.1; Maps 1, 2, and 2a
(B)(1)	Characteristics of the Wind at the Proposed Site: interannual variation	9.1.1
(B)(2)	Characteristics of the Wind at the Proposed Site: seasonal variation	9.1.2
(B)(3)	Characteristics of the Wind at the Proposed Site: diurnal conditions	9.1.3
(B)(4)	Characteristics of the Wind at the Proposed Site: atmospheric stability, to the extent available	9.1.4
(B)(5)	Characteristics of the Wind at the Proposed Site: turbulence, to the extent available	9.1.5
(B)(6)	Characteristics of the Wind at the Proposed Site: extreme conditions	9.1.6

Minnesota Rule	Required Information	Application Section(s)
(B)(7)	Characteristics of the Wind at the Proposed Site: speed frequency distribution	9.1.7
(B)(8)	Characteristics of the Wind at the Proposed Site: variation with height	9.1.8
(B)(9)	Characteristics of the Wind at the Proposed Site: spatial variations	9.1.9
(B)(10)	Characteristics of the Wind at the Proposed Site: wind rose, in eight or more directions	9.1.10
(C)	Other meteorological conditions at the proposed site, including the temperature, rainfall, snowfall, and extreme weather conditions	9.1.11
(D)	The location of other wind turbines in the general area of the proposed LWECS	9.2; Map 14
Subpart 5	The applicant shall include in the application information describing the applicant's wind rights within the boundaries of the proposed site	7.0; Map 4
Subpart 6	<u>Design of Project</u>	
(A)	A project layout, including a map showing a proposed array spacing of the turbines	5.1; Map 3
(B)	A description of the turbines and towers and other equipment to be used in the project, including the name of the manufacturers of the equipment	5.2
(C)	A description of the LWECS electrical system, including transformers at both low voltage and medium voltage	5.3, 5.3.1-5.3.3
(D)	A description and location of associated facilities	6.0, 6.1-6.4

Subpart 7	<u>Environmental Impacts</u>	
(A)	Demographics, including people, homes, and businesses	8.1, 8.1.1, 8.1.2, 8.2, 8.2.1-8.2.5
(B)	Noise	8.3, 8.3.1-8.3.3
(C)	Visual impacts	8.4.1-8.4.4
(D)	Public services and infrastructure	8.5, 8.5.1-8.5.6
(E)	Cultural and archaeological impacts	8.6.1-8.6.3
(F)	Recreational resources	8.7.1-8.7.3
(G)	Public health and safety, including air traffic, electromagnetic fields, and security and traffic	8.8.1-8.8.9
(H)	Hazardous materials	8.9.1-8.9.3
(I)	Land-based economics, including agriculture, forestry, and mining	8.10.1-8.10.7
(J)	Tourism and community benefits	8.11, 8.11.1, 8.11.2, 8.12, 8.12.1-8.12.3
(K)	Topography	8.13.1-8.13.3
(L)	Soils	8.14.1-8.14.3
(M)	Geologic and groundwater resources	8.15.1-8.15.3
(N)	Surface water and floodplain resources	8.16.1-8.16.5
(O)	Wetlands	8.17.1-8.17.3
(P)	Vegetation	8.18.1-8.18.3
(Q)	Wildlife	8.19, 8.19.1-8.19.6

(R)	Rare and unique natural resources	8.19, 8.19.1-8.19.6
Subpart 8	<u>Construction of project.</u> The applicant shall describe the manner in which the project, including associated facilities, will be constructed	10.0-10.5
Subpart 9	<u>Operation of project.</u> The applicant shall describe how the project will be operated and maintained after construction, including a maintenance schedule	10.6
Subpart 10	<u>Costs.</u> The applicant shall describe the estimated costs of design and construction of the project and the expected operating costs.	10.7
Subpart 11	<u>Schedule.</u> The applicant shall include an anticipated schedule for completion of the project, including the time periods for land acquisition, obtaining a site permit, obtaining financing, procuring equipment, and completing construction. The applicant shall identify the expected date of commercial operation.	10.8
Subpart 12	<u>Energy projections.</u> The applicant shall identify the energy expected to be generated by the project.	10.9
Subpart 13	<u>Decommissioning and Restoration</u>	
(A)	The anticipated life of the project	10.10.1
(B)	The estimated decommissioning costs in current dollars	10.10.2
(C)	The method and schedule for updating the costs of decommissioning and restoration	10.10.4
(D)	The method of ensuring that funds will be available for decommissioning and restoration	10.10.3
(E)	The anticipated manner in which the project will be decommissioned and the site restored	10.10.5
Subpart 14	<u>Identification of other permits.</u> The applicant shall include in the application a list of all known federal, state, and local agencies or authorities, and titles of the permits they issue that are required for the proposed LWECS.	11.0

1.0 APPLICANT INFORMATION

Overview

Lake Benton Power Partners II, LLC (Lake Benton Wind II or Applicant) submits this Application for to the Minnesota Public Utilities Commission (Commission) for a Site Permit to construct and operate the 100.2 megawatt (MW) Lake Benton Wind II Repowering Project (Project). Lake Benton Wind II is an indirect, wholly-owned subsidiary of NextEra Energy Resources, LLC (NEER).¹ The Applicant will develop and construct the proposed Project. As explained in Docket No. E-002/M-16-777, Lake Benton Wind II is a build and transfer project, and, accordingly, the Site Permit will be transferred to Northern States Power Company (NSP) on the commercial operations date. Given the size of the Project, it is a large wind energy conversion system (LWECS) as defined in the Wind Siting Act, Minnesota Statutes Chapter 216F. The Project is located in Pipestone County at the site of the existing Lake Benton wind facility in southwestern Minnesota, immediately southwest of the City of Ruthton and north of the City of Holland, Minnesota.

The Applicant, as a member of the NextEra Energy, Inc. family of companies, benefits from the capabilities developed within its network of affiliated companies, which combine to make NextEra Energy, Inc. the world's largest generator of renewable energy from the wind and sun. One such example is WindLogics, Inc. (WindLogics), which is a Minnesota-based affiliate of Lake Benton Wind II. WindLogics has decades of experience in providing engineering, technical analysis, and consulting services in the field of studying, modeling, and forecasting meteorological air flow, including scientific analysis of wind resources, wind-modeling services and climate-prediction services in support of wind-farm development. Among other contributions, WindLogics supported the development and optimization of the new Lake Benton Wind II array and provided inputs and data for Section 9 of the Application. Additional internal capacities, which also include engineering and construction, environmental, legal and regulatory, land acquisition services, and project management have been utilized to develop the Project, and this in-house expertise is supplemented by highly qualified external consultants.

Repower of Existing LWECS

The Lake Benton Wind II LWECS is a repowering of an existing wind facility consisting of 137 wind turbines, overhead and underground collection lines, access roads, four Point of Interconnect (POI) collector substations, ancillary equipment, and an operations and maintenance facility. The vast majority of the existing 137 wind turbines have a rotor swept area of 6,440 ft

¹ NEER is a global leader in development and operation of renewable energy resources, with a total generating capacity of 14,255 MW of wind generation in operation as of December 31, 2017.

(1,963 m) and several have a rotor swept area of 5,935 ft (1,809 m). The existing Lake Benton Power Partner II wind facility permitted on May 21, 1998 (Permit No. NSP & LBPP-LWECS-1-1998) will be decommissioned just prior to the start of construction of the proposed Project. The Applicant will make a separate filing on the decommissioning activities closer to the actual decommissioning of the existing turbines in 2019. Generally, however, decommissioning of the existing facilities will include the following activities:

- Lake Benton Power Partners II, LLC will identify components of the existing facility that will not be removed and will be used for development of the Project. It is anticipated that the use of several existing access roads and four POI substations will continue. It is generally anticipated that other components of the existing facility will not continue to be used and will be removed to a depth of four feet.
- For access roads that are not to be used for the proposed Project, Lake Benton Power Partners II, LLC will work with landowners regarding whether the landowner prefers to keep the access road in place. In the event landowners do not want the access road, or portions thereof, the access roads will be removed.
- Decommissioning will include the dismantling and removal of the existing wind towers, wind turbine generators, transformers, overhead cables, foundations, buildings, and ancillary equipment to a depth of four feet. Turbine tower sections will be dismantled utilizing cranes.
- Underground cables will be removed generally to a depth of four feet; however, in some cases, and in coordination with appropriate entities such as NSP, Minnesota Department of Natural Resources (MNDNR), Minnesota Board of Water and Soil Resources, the landowner, the Commission, and others, underground cables may remain in place to avoid surficial disturbance of sensitive features, such as prairies, habitat, or wetlands.
- After dismantling and excavating the facility, high value components will be removed for scrap value. The remaining materials will be reduced to transportable size and removed from the site for disposal. Materials will be disposed where disposal is permitted and where there is capacity for the disposal.
- Vacated areas, resulting from facility removal, will be filled with clean, compatible subgrade material that will be compacted to a density similar to surrounding areas. These areas will then be covered with topsoil.
- Unexcavated areas compacted by equipment used in the decommissioning may be tilled in a manner adequate to restore the topsoil and subgrade material to a density consistent with the surrounding areas.
- Following the removal of the existing facility, the areas disturbed by the decommissioning activities will be restored. Lake Benton Power Partners II, LLC will restore and reclaim the areas disturbed by the decommissioning.

Other LWECSs

Although the Applicant does not own or have a direct financial interest in any other LWECS located in Minnesota, NEER has ownership and financial interests in: (1) the formerly operating 26.3 MW Buffalo Ridge Wind Energy Center in Lincoln County, which has been

decommissioned; (2) the 98.2 MW Mower County wind facilities in Mower County; and (3) the to-be-decommissioned 102.8 MW Lake Benton II project in Pipestone County.

Authorized Representatives

The authorized representatives for the Applicant are:

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May 3, 2018

2.0 CERTIFICATE OF NEED

On September 1, 2017, in Docket No. E002/M-16-777, the Commission issued an Order approving the Petition of Xcel Energy for Approval of the Acquisition of Wind Generation from the Company's 2016-2030 Integrated Resource Plan, which included the build and transfer of the Project to NSP. In that Order, the Commission also ruled that:

The Commission also concurs that the four Minnesota projects (Blazing Star I and II, Freeborn, and Lake Benton) are exempt from the certificate of need process under Minn. Stat. § 216B.2422, subd. 5, because they were selected in a bidding process approved by the Commission.

Thus, Lake Benton Wind II does not require a certificate of need.

3.0 STATE POLICY

Pursuant to Minnesota Statutes § 216F.03, the Lake Benton Wind II Project is designed to further the state policy of siting a project in an orderly manner compatible with environmental preservation, sustainable development and the efficient use of resources. For example, the Project is designed to maximize the wind resource development, while minimizing impact on land resources and the environment. As required, the Application addresses the Site Permit criteria set forth in Minnesota Statutes § 216E.03, subd. 7 and Minnesota Rules Chapter 7854. Therefore, sufficient project design, wind resource, and technical information are provided herein for a thorough evaluation of the reasonableness of the proposed site and Project.

To facilitate the review of this Application, it has been organized and prepared following the *Minnesota Department of Commerce, Energy Facility Permitting Application Guidance for Site Permitting of Large Wind Energy Conversion Systems in Minnesota* (DOC, 2010).

4.0 PROJECT DESCRIPTION

4.1 Project Description and Location

The Project is located in Pipestone County in southwestern Minnesota, immediately southwest of the City of Ruthton and north of the City of Holland, Minnesota. Table 4.1 lists the Township, Range, and Sections in which the Project is located.

Table 4.1: Project Location

County Name	Township Name	Township	Range	Sections
Pipestone	Fountain Prairie	108	45	1,2, 11-14, 24
Pipestone	Aetna	108	44	5-9, 16-22, 26-36
Pipestone	Rock	107	44	1-4, 10-15

4.2 Size of the Project Area in Acres

Lake Benton Wind II plans to site the Project equipment and facilities within the Project Area as shown on **Map 1 (Project Location)**. The estimated size of the Project Area is 25,597 acres (10,359 hectares) (approximately 40.0 square miles or 104 square kilometers) of mostly agricultural land. The size of the Project Area allows some siting flexibility in the event turbine locations currently identified prove to be unsuitable and provides sufficient room for the required setbacks and buffering of sensitive features. The siting of the turbines, collector substations, collector lines, meteorological towers, and O&M facility will be within the Project Area.

The Project Area contains the existing Lake Benton II Project consisting of 137 Zond 0.75 MW turbines, which will be decommissioned just prior to the proposed construction of the Project. Also, there are turbines associated with several other wind energy projects, which are not associated with NEER or the Applicant, located within the Project Area.

4.3 Related Capacity

The rated capacity of the Project is up to 100.2 MWs.

The Lake Benton Wind II turbines will be grouped into three or four clusters of underground electrical collector cables into three or four existing 34.5kV POI substations owned by NSP (Delta, Echo, Foxtrot, and Golf). Specifically, the Project will either use all four POIs or the following three (Delta, Echo, and Golf), which will be determined upon acceptance/rejection by Midcontinent Independent Transmission System Operator (MISO) of the revised total MW

allocations to three stations rather than four. All attached maps that include collector circuits have been produced to show the use of 3 or all 4 POIs. Each of the POI collection substations contains protection relaying, metering, circuit breakers, and manual disconnects. These POI stations currently exist at the below addresses and will maintain their original boundaries; however, certain areas of fence may need to be temporarily removed to accommodate construction activities within the stations.

Delta
2299 150th Avenue
Ruthton, MN 56170

Echo
2164 150th Avenue
Ruthton, MN 56170

Foxtrot
1645 201st Street
Ruthton, MN 56170

Golf
1703 180th Avenue
Holland, MN 56139

Given the 34.5kV voltage level of the collector lines and POIs, Lake Benton Wind II is not required to submit a separate Transmission Route Permit application for a generation tie line.

4.4 Number of Turbine Sites

The Project's total capacity of 100.2 MW will be generated using 39 GE 2.3-116 wind turbines and 5 GE 2.1-116 wind turbines. The current turbine layout includes 44 primary turbines required for the Project with four alternative turbine locations identified. A maximum of 44 turbines are proposed for construction, with the inclusion of alternative locations to provide for flexibility in the event development or constructability issues are encountered. The current wind turbine array is set forth on **Map 2 (Four POI Project Area and Facilities)** and **Map 2a (Three POI Project Area and Facilities)**.

4.5 Meteorological Towers

The Project will include installation of up to two permanent MET towers. Consistent with Commission requirements, the MET towers will be no closer than 250 feet (76 meters) from the edge of road rights-of-way. The MET towers will be permanent and will remain for the duration of the Project's operations. Permanent MET towers will be free standing, made of galvanized steel with medium intensity dual LED day and night lights as required by the FAA, and will have

the capability to have acoustic recording equipment installed on them. Additional information on the permanent MET towers is provided in Section 6.3.2.

4.6 Percent of Wind Rights Secured

As of the date of this filing, the Project has land control agreements with landowners for approximately 9,600 acres (3,885 hectares) and approximately 38% of the land within the Project boundary. The Applicant continues to engage with landowners and expects to have sufficient land control to support this 100.2 MW Project.

5.0 PROJECT DESIGN

5.1 Description of Project Layout

The Project optimizes the wind resource while minimizing impacts to land use and the environment. The Project is sited in locations where landowners are willing to provide Lake Benton Wind II with wind rights. Many factors influence the best placement of project infrastructure including site topography, natural resources, cultural resources, land constraints, proximity to residences, turbine technology, engineering, landowner preferences, and siting criteria (including the setback requirements set forth in Table 5.1). Use of the access roads associated with the existing Lake Benton II project that is to be decommissioned is accounted for in the design of the Project. Some existing access roads will remain in place and will be reused for the purposes of the Project. At this time, while over 99% of the micrositing process for turbine placement has been completed, the precise turbine placement and project layouts have not been finalized and are subject to adjustment based upon pre-construction activities including, but not limited to geotechnical and environmental surveys, land acquisition, micrositing and field constructability reviews, and the identification and avoidance of siting constraints.

Preliminary site layouts are shown on **Map 3 (Turbine Layout and Constraints)**. The Project layout adheres to the wind energy conversion facility siting criteria outlined in the Commission's *Order Establishing General Wind Permit Standards*, Docket No. E, G999/M-07-1102 (MPUC, 2008) applicable regulations or agency guidance, and NEER's internal setback standards and avoidance of sensitive features. Table 5.1 summarizes the Commission's setback standards applicable to the Project, based on the 2007 standards as well as accounting for setbacks required in recent site permit conditions. The Project is designed to meet the setback standards summarized in Table 5.1. For example, consistent with the 3 rotor diameter by 5 rotor diameter LWECS setback requirement (*i.e.*, 3 RD X 5RD setback), properties not participating in the Project will have turbines set back from their property in non-prevailing wind directions by at least 1,147 feet (350 meters or 3 RD) and by at least 1,911 feet (583 meters or 5 RD) in the prevailing wind directions for both the GE 2.3 MW turbine model and the GE 2.1 MW turbine model.

Remnant grassland habitats, wetlands, streams, sites of biodiversity significance, and other sensitive features are present within the Project Area. As discussed in Section 8 of this Application, siting of project infrastructure largely avoids sensitive environmental features.

Table 5.1: Wind Turbine Setback Requirements

Wind Facility and Collector Lines Setback Categories	Setback Conditions as Represented in Recent Site Permits	Related to Setback Condition
--	--	------------------------------

Wind Facility and Collector Lines Setback Categories	Setback Conditions as Represented in Recent Site Permits	Related to Setback Condition
WIND ACCESS BUFFER –	Wind turbine towers shall not be placed less than five (5) rotor diameters (RD) on prevailing wind directions and three (3) RD on non-prevailing wind directions from the perimeter of the lands where the Permittee does not hold the wind rights, without the approval of the Commission. This section does not apply to public roads and trails.	
INTERNAL SPACING	The turbine towers shall be constructed within the site boundary as approved by the Commission. The turbine towers shall be spaced no closer than three (3) RD in non-prevailing wind directions and five (5) RD on prevailing wind directions. If required during final micro-siting of the turbine towers to account for topographic conditions, up to 20 percent of the towers may be sited closer than the above spacing but the Permittee shall minimize the need to site the turbine towers closer.	
NOISE	<p>Greater of 1000 feet (305 meters) for participating residents and for non-participating residents</p> <p>or</p> <p>Compliance with noise standards established as of the date of this permit by the Minnesota Pollution Control Agency (MPCA) at all times at all appropriate locations. The noise standards are found in Minnesota Rules chapter 7030. https://www.revisor.mn.gov/rules/?id=7030.0030 https://www.revisor.mn.gov/rules/?id=7030.0040</p> <p>Turbine operation shall be modified or turbines shall be removed from service if necessary to comply with these noise standards. The Permittee or its contractor may install and operate turbines, as close as the minimum setback required in this permit, but in all cases shall comply with MPCA noise standards. The Permittee shall be required to comply with this condition with respect to all residences or other receptors in place as of the time of construction, but not with respect to such receptors built after construction of the towers.</p>	A greater than 1,000 foot (305 meter) setback is necessary in certain cases to minimize noise and shadow flicker concerns.
ROADS	Wind turbine and MET towers shall not be located closer than 250 feet (76 meters) from the edge of the nearest public road (ROW) right-of-way.	
PUBLIC LANDS	Wind turbines and associated facilities including foundations, access roads, underground cable, and transformers, shall not be located in public lands, including Waterfowl Production Areas, Wildlife Management Areas, Scientific and Natural Areas, or in county parks, and wind turbine towers shall also comply with the	

Wind Facility and Collector Lines Setback Categories	Setback Conditions as Represented in Recent Site Permits	Related to Setback Condition
	setbacks of WIND BUFFER ACCESS.	
PUBLIC WATER WETLANDS	Wind turbines and associated facilities including foundations, access roads, underground cable, and transformers, shall not be placed in public waters wetlands, as defined in Minnesota Statutes section 103G.005, subdivision 15a, except that electric collector or feeder lines may cross or be placed in public waters or public waters wetlands subject to permits and approvals by the MNDNR, the United States Army Corps of Engineers (USACE), and local units of government as implementers of the Minnesota Wetland Conservation Act.	
METEOROLOGICAL TOWERS	<p>Permanent towers for meteorological equipment shall be free standing. Permanent meteorological towers shall not be placed less than 250 feet (76 meters) from the edge of the nearest public road ROW and from the boundary of the Permittee's site control, or in compliance with the county ordinance regulating meteorological towers in the county the tower is built, whichever is more restrictive.</p> <p>Meteorological towers shall be placed on property the Permittee holds the wind or other development rights.</p> <p>Meteorological towers shall be marked as required by the FAA. There shall be no lights on the meteorological towers other than what is required by the FAA. This restriction shall not apply to infrared heating devices used to protect the wind monitoring equipment.</p>	
AVIATION	<p>The Permittee shall not place wind turbines or associated facilities in a location that could create an obstruction to navigable airspace of public and licensed private airports (as defined in Minnesota Rule 8800.0100, subparts 24a and 24b) in Minnesota, adjacent states, or provinces. https://www.revisor.mn.gov/rules/?id=8800.0100 The Permittee shall apply the minimum obstruction clearance for licensed private airports pursuant to Minnesota Rule 8800.1900, subpart 5. Setbacks or other limitations shall be followed in accordance with the Minnesota Department of Transportation (MnDOT), Department of Aviation, and FAA. The Permittee shall notify owners of all known airports within six (6) miles (10 kilometers) of the Project prior to construction. https://www.revisor.mn.gov/rules/?id=8800.1900</p>	
FOOTPRINT MINIMIZATION	The Permittee shall design and construct the LWECS so as to minimize the amount of land that is impacted by the LWECS. Associated facilities in the vicinity of turbines such as electrical/electronic boxes, transformers, and monitoring systems shall, to the greatest extent feasible, be mounted on the foundations used for turbine towers or inside the towers unless otherwise negotiated with the affected landowner(s).	

Wind Facility and Collector Lines Setback Categories	Setback Conditions as Represented in Recent Site Permits	Related to Setback Condition
COMMUNICATION CABLES	The Permittee shall place all supervisory control and data acquisition (SCADA) communication cables underground and within or adjacent to the land necessary for turbine access roads unless otherwise negotiated with the affected landowner(s).	
ELECTRICAL COLLECTOR AND FEEDER LINES	<p>Collector lines that carry electrical power from each individual transformer associated with a wind turbine to an internal project interconnection point shall be buried underground. Collector lines shall be placed within or adjacent to the land necessary for turbine access roads unless otherwise negotiated with the affected landowner(s).</p> <p>Feeder lines that carry power from an internal project interconnection point to the Project substation or interconnection point on the electrical grid may be overhead or underground. Feeder line locations shall be negotiated with the affected landowner(s).</p> <p>Any feeder lines that parallel public roads shall be placed within the public ROW or on private land immediately adjacent to public roads. If feeder lines are located within public ROW, the Permittee shall obtain approval from the governmental unit responsible for the affected ROW.</p> <p>Collector and feeder line locations shall be located in such a manner to minimize interference with agricultural operations, including, but not limited to, existing drainage patterns, drain tile, future tiling plans, and ditches. Safety shields shall be placed on all guy wires associated with overhead feeder lines. The Permittee shall submit the engineering drawings of all collector and feeder lines in the site plan.</p> <p>The Permittee must fulfill, comply with, and satisfy all Institute of Electrical and Electronics Engineers, Inc. (IEEE) standards applicable to this Project, including but not limited to, IEEE 776 [Recommended Practice for Inductive Coordination of Electric Supply and Communication Lines], IEEE 519 [Harmonic Specifications], IEEE 367 [Recommended Practice for Determining the Electric Power Station Ground Potential Rise and Induced Voltage from a Power Fault], and IEEE 820 [Standard Telephone Loop Performance Characteristics] provided the telephone service provider(s) have complied with any obligations imposed on it pursuant to these standards. Upon request by the Commission, the Permittee shall report to the Commission on compliance with these standards</p>	

5.2 Description of Turbines and Towers

The Project will use 39 GE 2.3 wind turbines with 116.5-meter (382.2-foot) blade diameters and 90-meter (295-foot) hub height towers and 5 GE 2.1 wind turbines with 116.5-meter (382.2-foot) blade diameters and 80-meter (263-foot) hub height towers. The turbine characteristics for these

turbine models are summarized in Table 5.2. The selected turbines are each three-bladed, active yaw, and active aerodynamic control regulated wind turbine generators with generator/converter torque control capabilities (GE Renewable Energy 2017). The rotors utilize blade pitch regulation and other technologies to achieve optimum power output under various site conditions and wind speeds. Nine turbines will utilize LNTE serrations on the turbine blades to reduce sound impacts. LNTE serrations will be the same color as the turbine blades and will cover approximately 20-30% of the trailing edge of the outboard blade length.

Table 5.2: Wind Turbine Characteristics

Design Features	GE 2.3 Wind Turbine	GE 2.1 Wind Turbine
Nameplate Capacity	2.3MW	2.1MW
Hub Height	90 (m) (295 ft.)	80 (m) (263 ft.)
Rotor Swept Area	10,660 (sq. m) (114,743 sq. ft.)	10,660 (sq. m) (114,743 sq. ft.)
Total Height	148.3 (m) (486.6 ft.)	138.3 (m) (453.7 ft.)
Rotor Diameter	116.5 (m) (382.2 ft.)	116.5 (m) (382.2 ft.)
Cut in Wind Speed	3 m/s (10 ft./s)	3 m/s (10 ft./s)
IEC Wind Class	IIS	IIS
Cut Out Wind Speed	32 m/s (105 ft./s)	25 m/s (82 ft./s)
Rotor Speed	8-15.7 RPM	8-15.7 RPM
Tip Speed	191 MPH (307 km/hr)	191 MPH (307 km/hr)
Sound at Turbine	107.5 dBA	107.5 dBA
Power Regulation	Blade pitch controls power. Controls included for ZVRT and enhanced reactive power (0.9 power factor)	Blade pitch controls power. Controls included for ZVRT and enhanced reactive power (0.9 power factor)
Generation	2.3MW per turbine	2.1MW per turbine

Design Features	GE 2.3 Wind Turbine	GE 2.1 Wind Turbine
Tower	Multi-coated, conical tubular steel with safety ladder to the nacelle. Rest platforms each section.	Multi-coated, conical tubular steel with safety ladder to the nacelle. Rest platforms each section.
Supervisory Control and Data Acquisition	Each turbine equipped with SCADA controller hardware, software and database storage capability	Each turbine equipped with SCADA controller hardware, software and database storage capability
FAA Lighting	Yes, per FAA permitting	Yes, per FAA permitting
Foundation	Per Manufacturer specifications - Spread Foot or pier foundation-TBD	Per Manufacturer specifications -Spread Foot or pier foundation-TBD

Source: GE manufacturer specifications (GE Renewable Energy 2017).

Each turbine is comprised of a foundation, tower, nacelle, hub, and three blades (GE Renewable Energy 2017). The turbine towers are comprised of tapered steel cylinders consisting typically of three to four sections joined together via factory fabricated welds which are automatically controlled and ultrasonically inspected during manufacturing per American National Standards Institute (ANSI) specifications. Wind turbine surfaces are coated for protection against corrosion in generally non-glare white, off white, or gray. Each turbine can be accessed through a lockable steel door at the base of the tower, through which the nacelle and turbine blades can be accessed. Inside each tower, platforms are accessible via ladder or lift which are equipped with fall arresting safety systems.

Each turbine tower includes a control panel housing electronic and communication equipment. Each nacelle includes a wind speed and direction sensor that supports signaling when winds are sufficient for turbine operation. Each turbine is equipped with variable-speed control and independent blade pitch to enhance efficiency. An automated SCADA system located at the project substation provides local and remote supervision and control of turbine equipment and performance.

5.3 Description of Electrical System

Construction of the project will include 44 wind turbines, each with its own step-up transformer pad-mounted outside at the base of unit (stepping up to 34.5kV). Energy from the turbines will be routed through an underground electrical collection system that will deliver power to three or four of the existing POI stations (Delta, Echo, Foxtrot, and Golf) where it is delivered at 34.5kV to conductors owned and operated by NSP. See Section 6.1 and 6.2 for a more detailed

description of the proposed electrical system. The Project will have its electrical system designed under contract by a professional, experienced and qualified electrical system design firm. The entire collection system will be designed to meet NESC, NEC, ANSI, NEMA, and OSHA standards. The design work includes a load flow analysis for the Project to ensure the facility will meet the power factor and voltage control specifications. A coordination study will determine the appropriate protective relay settings for optimum protection and selectivity for the Project's electrical system. Preliminary electric collection layouts for both the use of a four or three POI are provided on **Map 2 (Four POI Project Area and Facilities)** and **Map 2a (Three POI Project Area and Facilities)**, respectively.

5.3.1 Transformers

Power from the turbines is fed through a breaker panel at the turbine's base inside the tower and is interconnected to a pad-mounted step-up transformer, which steps the voltage up from 690 volt (V) to 34.5 kV. The transformer impedance will be optimized based on the facility power output requirements and feeder circuit-breaker interrupting ratings and internal fuses. Protection for the transformer and wind turbine is provided by a switch breaker at the turbine bus cabinet electrical panel, inside the tower. The pad-mounted transformers are interconnected on the 34.5 kV voltage side to underground cables to form an electrical collection system.

5.3.2 Electrical Collection System

The Project will utilize 34.5 kV electrical power lines to collect power from the turbines and transmit it to the Lake Benton II collector substation. The entire collection system will be direct buried underground cable. The underground cables are installed in a trench that is approximately three to four feet deep. Underground paths will typically take the shortest path to create less impact to the surrounding areas. Based on preliminary soil resistivity results within the Project Area, it is anticipated that native soil will be used as backfill material.

5.3.3 Collector Substation and Interconnection

The Project will interconnect into the existing 34.5kV POI collection substations owned by NSP (Delta, Echo, Foxtrot, and Golf).

6.0 DESCRIPTION AND LOCATION OF ASSOCIATED FACILITIES

Maps 2 and **2a** show the proposed locations of wind turbines, underground collection lines, crane walk paths, access roads, MET towers, the O&M facility, and other associated facilities.

6.1 Transmission and Project Substations

The Project turbines will be grouped into up to four underground collection circuits connecting into up to four existing 34.5kV POI collection substations owned by NSP (Delta, Echo, Foxtrot, and Golf). Each POI collection substation contains protection relaying, metering, circuit breakers, and manual disconnects within a fenced enclosure. The POI collection substations will maintain their original boundaries; however, minor modifications to these existing substations will be made to accommodate the Project. These modifications include breaker replacements, replacement/relocation of metering equipment, and the replacement of the existing control houses. No new transmission lines or substations are proposed for the Project.

6.2 Collector Lines and Feeder Lines

Power generated from each turbine will be fed down the turbine tower from the generator through the power conditioning equipment and breaker panel. The generator voltage will then be stepped up to the collector system voltage of 34.5 kV by means of a pad-mounted step-up transformer located outside the base of each tower. The power from each turbine will then be routed to up to four POI stations through the underground collection lines. Approximately 27 miles (44 kilometers) of underground collection line will be installed. The underground collection line cable installation will be trenched direct-buried and will include both a warning tape and tracer cable that will provide attention to the cables should any digging occur near the cables following their installation. **Map 2** and **2a** shows the preliminary design of the underground collection lines.

The power from the Delta and Echo POIs will be routed to the existing Buffalo Ridge Substation which is owned by Xcel Energy. The power from the Foxtrot and Golf POIs can be routed to either the existing Buffalo Ridge Substation or the existing Chanarambie Substation owned by Xcel Energy. Foxtrot and Golf POIs have a manual switch between them that allows the power to flow to either substation. In all cases, the power from the four POIs is transmitted via existing overhead 34.5 kV distribution lines.

6.3 Other Associated Facilities

6.3.1 O&M Facility

An O&M facility will be constructed within the Project Area to serve as a center for the Project's O&M efforts, provide Project access and storage, and house the SCADA system. The O&M

facility will be used by the operations staff for facility maintenance and operation. It provides office space for the crews, as well as a shop/storage area for spare parts and vehicles. It will also house the central monitoring equipment for the generating facility where the turbines are monitored and controlled. The footprint of the facility will be up to 5 acres (2 hectares) and will include a parking lot and O&M building. The O&M building will be approximately 7,500 square feet (697 square meters) and will house Project equipment. There will also be a parking lot adjacent to the building. A building permit will be obtained from Pipestone County for the O&M facility.

6.3.2 Permanent Meteorological Tower

Lake Benton Wind II proposes to construct up to two (2) MET towers that will remain operational for the duration of the Project's operations. The expected locations of the two (2) permanent meteorological towers are shown on **Map 2** and **Map 2a**. The precise location of MET towers in the Project Area have yet to be determined and will be based upon the final locations of the wind turbines and for proper operation of wind assessment equipment. All towers will be no closer than 250 feet (76 meters) from the edge of road ROW and from the boundaries of Lake Benton Wind II's site control. Consistent with the typical Commission site permit requirements, the permanent met towers will be free-standing and will not use guy wires. The MET towers will be approximately 295 feet tall (90 meters).

The MET towers will contain instruments such as anemometers, data loggers, wind direction sensors, temperature probes that can be configured at various elevations, and a communication system for providing remote reporting of the data being collected. The temporary area required to construct the meteorological towers is expected to be approximately 400 by 400 feet (122 by 122 meters) and includes equipment storage, material lay down, and construction staging. The permanently impacted area of the MET tower, once installed, will be less than 0.1 acre (0.04 hectares) since they will be self-supporting monopole structures.

FAA Determinations of No Hazard will be obtained for each tower location prior to installation and each location will have appropriate lighting and marking as required by FAA.

6.3.3 Turbine Access Roads, Temporary Laydown/Staging Areas, and Other Associated Facilities

Each turbine will have a low-profile, gravel access road that will connect the turbine from the public road network or private access roads to the turbine location. In some cases, existing access roads that are in place from the existing Lake Benton II project will be re-used as access roads for the proposed Project. These existing access roads may be widened or re-surfaced as appropriate. All access road networks for the project will be designed to serve the Project in an

efficient manner, with the needs of landowners and comments from local authorities considered. The roads will be all-weather gravel construction and approximately 16 feet (5 meters) wide once the wind project is operational. The approximate length of permanent access roads to be installed is 13 miles (21 kilometers) with final length determined by final layout.

During construction, temporary access roadways will be prepared to facilitate crane movement and equipment delivery during construction. These temporary access roadways will be constructed to a width of up to 40 feet (12 meters). Drainage culverts will be installed as appropriate.

The Project will also require grading of a primary temporary laydown area of approximately 10 acres (4 hectares). The temporary laydown area will serve as a location for: (i) parking during construction; (ii) siting office trailers; and (iii) siting a storage and staging area for materials and equipment during construction. The temporary laydown area will be located in cropland or pastureland where land use rights have been acquired and environmental surveys have been conducted.

Additionally, a concrete batch plant may be temporarily established at the laydown area or O&M building, if necessary, to provide concrete production during construction.

6.4 Associated Facilities Permitting

Following the issuance of the LWECS Site Permit from the Commission, Lake Benton Wind II will be responsible for obtaining all other applicable permits, approvals, and licenses associated with the construction of the Project. Table 11 provides a summary of the permits and approvals that may be required.

7.0 WIND RIGHTS

Lake Benton has substantially completed securing landowner agreements for wind rights and property easements necessary to support the Project. The overall area within the project boundary consists of approximately 25,597 acres (approximately 10,359 hectares). The Project has executed and recorded landowner agreements for 9,600 acres (3,885 hectares) of private land within the Project Area which is roughly 37.5 % of the land within the overall project boundary. Current participating and non-participating parcels and landowners are shown on **Map 4 (Parcel Land Status)**. The secured easement agreements will ensure access for construction and operation of the Project and identifies landowner and Lake Benton's obligations and responsibilities during the implementation and operation of the wind project. Project facilities have been sited on leased land, and the current leasehold is sufficient to accommodate the proposed 100.2 MW project in compliance with the setback requirements identified in Table 5.1, above.

8.0 ENVIRONMENTAL IMPACTS

In accordance with Minnesota Rule 7854.0500, Subp. 7, Section 8 provides an analysis of the potential impacts of the Project, proposed mitigation measures, and any adverse environmental effects that cannot be avoided. The Applicant has consulted with various entities, including MNDNR, USFWS, USACE, the Minnesota Board of Water, the Soil Resources Local Government Unit Pipestone County Soil and Water Conservation District, Pipestone County.

Coordination with MNDNR and USFWS included the receipt of an initial MNDNR Natural Heritage Review letter, an in-person kickoff meeting, and on-going coordination throughout project development. Per MNDNR's request, a second Natural Heritage Review will be requested following development and refinement the complete infrastructure layout. Further, the Applicant has coordinated with the USACE and Pipestone County Soil and Water Conservation District through in-person meetings. A more detailed list of agencies and entities contacted and coordinated with is set forth in **Appendix A (Agencies Contacted Regarding Project)** and the correspondence received from the agencies is included in **Appendix B (Agency Correspondence and Responses)**.

8.1 Demographics

The Project is located in southwestern Minnesota in an agricultural/rural region within Pipestone County. The 2010 census population for Pipestone County was 9,596 (U.S. Census Bureau 2010), while the U.S. Census 2015 American Community Survey (ACS) population estimate for Pipestone County was 9,354, representing a population decrease of approximately 2.5% (U.S. Census Bureau 2015). The county seat of Pipestone County is the city of Pipestone, located approximately nine miles southwest of the Project Area.

Table 8.1 shows the U.S. Census Bureau 2011-2015 ACS demographic profile data for the state of Minnesota, Pipestone County, and townships within the Project Area including: Fountain Prairie, Aetna, Rock, and Grange (U.S. Census Bureau 2015). The demographic profile summarizes some of the population and economic characteristics of Minnesota, Pipestone County, and the townships in which the project is located.

Table 8.1: Population and Economic Characteristics

Location	Population	Housing Units (Occupied)	Per Capita Income	Families Below Poverty Line (%)
Minnesota	5,419,171	2,124,745	\$32,157	7.3%
Pipestone County	9,354	3,980	\$26,842	9.2%
Fountain Prairie Township	168	60	\$32,802	12%
Aetna Township	177	66	\$29,765	1.9%

Location	Population	Housing Units (Occupied)	Per Capita Income	Families Below Poverty Line (%)
Rock Township	155	68	\$49,188	0.0%
Grange Township	195	79	\$34,874	1.5%

U.S. Census Bureau, 2011-2015 American Community Survey 5-Year Estimates

According to the ACS 2011-2015 estimates, educational services, health care, and social assistance accounted for 24.7% of jobs statewide in Minnesota, followed by manufacturing at 13.5% and retail trade at 11.2% (U.S. Census Bureau 2015). According to the ACS 2011-2015 estimates, educational services, health care and social assistance accounted for 22.3% of jobs in Pipestone County, followed by retail trade at 12.8% and agriculture, forestry, fishing and hunting at 11.8% (U.S. Census Bureau 2015).

8.1.1 Potential Impacts

The Project is not anticipated to significantly change the demographics of the Project Area or Pipestone County.

8.1.2 Mitigation Measures

No mitigation measures are proposed as the Project is not expected to impact the demographics of the local community.

8.2 Land Use

8.2.1 Local Zoning and Comprehensive Plans

Local municipalities develop comprehensive plans as community planning tools to guide the future and direction of land use and development within a county or municipality. Comprehensive plans generally include goals and objectives regarding current and future land use, demographics, housing trends, economic development, and natural resources. In preparing this Application, Lake Benton Wind II has reviewed Pipestone County's most recently adopted comprehensive plan, which includes land use planning for the cities and townships within and adjacent to the proposed Project Area. Table 8.2.1 provides an inventory of governing bodies within and adjacent to the Project Area, along with their respective comprehensive plans, if available.

Table 8.2.1: Comprehensive Plan Inventory for Local Governments

Governing Body	Name of Plan	Year Adopted	Associated Development Plan(s)
Pipestone County	Pipestone County Comprehensive Plan <i>Including the County's Water Plan</i>	2004	Pipestone County Zoning Ordinance Adopted December 13, 2005 Amended June 8, 2010, February 12, 2013, December 9, 2015, July 26, 2016, June 13 2017, and October 24, 2017.
City of Ruthton	None Adopted*	NA	2004 Pipestone County Comprehensive Plan <i>Including the County's Water Plan</i>
City of Holland	None Adopted*	NA	2004 Pipestone County Comprehensive Plan <i>Including the County's Water Plan</i>
Aetna Township	None Adopted*	NA	2004 Pipestone County Comprehensive Plan <i>Including the County's Water Plan</i>
Fountain Prairie Township	None Adopted*	NA	2004 Pipestone County Comprehensive Plan <i>Including the County's Water Plan</i>

Governing Body	Name of Plan	Year Adopted	Associated Development Plan(s)
Grange Township	None Adopted*	NA	2004 Pipestone County Comprehensive Plan <i>Including the County's Water Plan</i>
Rock Township	None Adopted*	NA	2004 Pipestone County Comprehensive Plan <i>Including the County's Water Plan</i>

*Government body is included in the 2004 Pipestone County Comprehensive Plan Including the County's Water Plan.

Pipestone County's Comprehensive Plan (including the County's Water Plan) (Pipestone County et al. 2015) serves as a land use planning tool with the intent to guide the direction of community future growth. It includes an overview of existing county-wide land use, cities, and townships as well as future land use, population and housing trends, economic development, and environmental characteristics. It also includes two appendices with detailed Census Profiles from the year 2000 and Wellhead Protection Areas.

The overall vision or focus of the Comprehensive Plan is a continued high quality of life for all residents with long term goals of promoting citizen participation, public awareness, and intergovernmental and agency cooperation. The Plan provides context for creating sustainable economic development strategies; protecting and preserving the area's natural, scenic, historic, and agricultural resources; maintaining an adequate supply of affordable housing; establishing community-based land use processes to help shape good land use decisions; maintaining a balanced mix of transportation options; and supporting research and providing information on the County's fiscal, environmental, and social issues (Pipestone County et al. 2015).

Lake Benton Wind II believes the Project is consistent with Pipestone County's Comprehensive Plan's goals to conserve farmland and natural resources, support economic and sustainable development, and provide a positive benefit to its citizens. Lake Benton Wind II also believes the proposed Project will be compatible with the rural, agricultural character of the county.

8.2.2 County or Local Ordinances

Under Minnesota Statute Section 216F.081, "The commission, in considering a permit application for LWECs in a county that has adopted more stringent standards, shall consider and apply those more stringent standards, unless the commission finds good cause not to apply the

standards.” Pipestone County’s Ordinance Section 5-10: Wind Energy Conversion Systems, subsection E related to setbacks is not intended to apply to the Project per Minnesota Statute Section 216F.081. As set forth in Pipestone County’s Ordinance Section 5-10, subsection A, the application of Section 5-10, including subsection E, is limited to:

. . . Wind Energy Conversion Systems (WECS) with a rated capacity of less than 25,000 kilowatts (kW) or 25 megawatts (MW), and to regulate the installation and operation of WECS not otherwise subject to siting and oversight by the State of Minnesota pursuant to Minnesota Statutes, Chapter 216F, Wind Energy Conversion Systems, as amended.

Thus, since the Project is subject to siting and oversight by the Commission pursuant to Minnesota Statutes, Chapter 216F, the entirety of Ordinance Section 5-10 does not apply to the Project. Therefore, the setbacks in Section 5-10, subsection E should not be considered by the Commission as more stringent standards under Minnesota Statute Section 216F.081. Should the Commission nevertheless determine that it must consider the County’s standards under Minnesota Statute Section 216F.081, Pipestone County has provided a letter on January 9, 2018 indicating that the County supports a finding that there is good cause not to apply the County’s standards to the Project. See **Appendix B** for a copy of the letter from Pipestone County. Specifically, the letter from Pipestone County stated: “Should the Commission nevertheless determine that it must consider the County’s standards under Minnesota Statute Section 216F.081, the County supports a finding that there is good cause not to apply the County’s specific standards as stated.”

The following table provides a comparison of the Pipestone County setbacks to the Commission’s setbacks.

Table 8.2.2 Comparison of Local Government and Commission Setbacks

Wind Facility and Collector Lines Setback Categories	Setback Conditions as Represented in Recent Site Permits	Pipestone County (Section 5-10, Subsections E, F and G) <u>Wind Turbine</u>	Pipestone County (Section 5-10, Subsections E, F and G) <u>Met Tower</u>
WIND ACCESS BUFFER	Wind turbine towers shall not be placed less than five (5) RD on prevailing wind directions and three (3) RD on non-prevailing wind directions from the perimeter of the lands where the Permittee does not hold the wind rights, without the approval of the Commission. This section does not apply to public roads and trails.	3 RD on east-west axis and 5 RD on north-south axis	The fall zone, as certified by a professional engineer + 10 feet (3 meters) or 1.1 times the total height, Minimum 250 feet (76 meters)
NOISE	Greater of 1000 feet (305 meters) for participating residents and non-participating residents or Compliance with noise standards established as of the date of this permit by the MPCA at all times at all appropriate locations. The noise standards are found in Minnesota Rules chapter 7030. https://www.revisor.mn.gov/rules/?id=7030.0030 https://www.revisor.mn.gov/rules/?id=7030.0040 Turbine operation shall be modified or turbines shall be removed from service if necessary to comply with these noise standards. The Permittee or its contractor may install and operate turbines, as close as the minimum setback required in this permit, but in all cases shall comply with MPCA noise standards. The Permittee shall be required to comply with this condition with respect to all homes or other receptors in place as of the time of construction, but not with respect to such receptors built after construction of the towers.	All WECS shall comply with Minnesota Rules 7030	
ROADS ²	Wind turbine and meteorological towers shall not be located closer than 250 feet (76 meters) from the edge of the nearest public road ROW.	1.1 times the height, may be reduced for minimum maintenance roads or a road with an Average Daily Traffic Count of less than 10.	The fall zone, as certified by a professional engineer + 10 feet (3 meters) or 1.1 times the total height. Minimum 250 feet (76 meters).
PUBLIC LANDS	Wind turbines and associated facilities including foundations, access roads, underground cable, and transformers, shall not be located in public lands, including Waterfowl Production Areas, Wildlife Management Areas, Scientific and Natural Areas, or in county parks, and wind turbine towers shall also comply with the setbacks of WIND BUFFER ACCESS REQUIREMENT.	3 RD on east-west axis and 5 RD on north-south axis.	600 feet (183 meters)

² Pipestone County requires the setback shall be measured from future rights-of-way if a planned changed or expanded ROW is known.

Wind Facility and Collector Lines Setback Categories	Setback Conditions as Represented in Recent Site Permits	Pipestone County (Section 5-10, Subsections E, F and G) <u>Wind Turbine</u>	Pipestone County (Section 5-10, Subsections E, F and G) <u>Met Tower</u>
WETLANDS	Wind turbines and associated facilities including foundations, access roads, underground cable, and transformers, shall not be placed in public waters wetlands, as defined in Minnesota Statutes section 103G.005, subdivision 15a, except that electric collector or feeder lines may cross or be placed in public waters or public waters wetlands subject to permits and approvals by the MNDNR, USACE, and local units of government as implementers of the Minnesota Wetland Conservation Act.	3 RD on east-west axis and 5 RD on north-south axis.	600 feet (182 meters)
TURBINE SPACING	The turbine towers shall be constructed within the site boundary as shown in the official site maps. The turbine towers shall be spaced no closer than three rotor diameters in the non-prevailing wind directions and five rotor diameters on the prevailing wind directions. If required during final micro siting of the turbine towers to account for topographic conditions, up to 20 percent of the towers may be sited closer than the above spacing but the Permittee shall minimize the need to site the turbine towers closer.	3 RD on east-west axis and 5 RD on north-south axis.	N/A
METEOROLOGICAL TOWERS	<p>Permanent towers for meteorological equipment shall be free standing. Permanent meteorological towers shall not be placed less than 250 feet (76 meters) from the edge of the nearest public road ROW and from the boundary of the Permittee's site control, or in compliance with the county ordinance regulating meteorological towers in the county the tower is built, whichever is more restrictive. Meteorological towers shall be placed on property the Permittee holds the wind or other development rights.</p> <p>Meteorological towers shall be marked as required by the FAA. There shall be no lights on the meteorological towers other than what is required by the FAA. This restriction shall not apply to infrared heating devices used to protect the wind monitoring equipment.</p> <p>(All meteorological towers shall be fitted with the necessary equipment to install or attach acoustic recording devices to monitor wildlife activity.)</p>		The fall zone, as certified by a professional engineer +10 feet (3 meters) or 1.1 times the total height, Minimum 250 feet (76 meters).

Wind Facility and Collector Lines Setback Categories	Setback Conditions as Represented in Recent Site Permits	Pipestone County (Section 5-10, Subsections E, F and G) <u>Wind Turbine</u>	Pipestone County (Section 5-10, Subsections E, F and G) <u>Met Tower</u>
AVIATION	The Permittee shall not place wind turbines or associated facilities in a location that could create an obstruction to navigable airspace of public and licensed private airports (as defined in Minnesota Rule 8800.0100, subparts 24a and 24b) in Minnesota, adjacent states, or provinces. https://www.revisor.mn.gov/rules/?id=8800.0100 The Permittee shall apply the minimum obstruction clearance for licensed private airports pursuant to Minnesota Rule 8800.1900, subpart 5. Setbacks or other limitations shall be followed in accordance with the MN/DOT, Department of Aviation, and FAA. The Permittee shall notify owners of all known airports within six (6) miles (10 kilometers) of the Project prior to construction. https://www.revisor.mn.gov/rules/?id=8800.1900	No turbines, tower or associated facilities shall be located so as to create an obstruction to navigable airspace of public and private airports in Pipestone County. Setbacks or other limitations determined in accordance with MN/DOT Department of Aviation and FAA requirements.	Same as Pipestone County Wind Turbine setback.
FOOTPRINT MINIMIZATION	The Permittee shall design and construct the LWECS so as to minimize the amount of land that is impacted by the LWECS. Associated facilities in the vicinity of turbines such as electrical/electronic boxes, transformers, and monitoring systems shall, to the greatest extent feasible, be mounted on the foundations used for turbine towers or inside the towers unless otherwise negotiated with the affected landowner(s).		
COMMUNICATION CABLES	The Permittee shall place all SCADA communication cables underground and within or adjacent to the land necessary for turbine access roads unless otherwise negotiated with the affected landowner(s).	All communications equal to or less than 34.5 kV in capacity, installed as part of a WECS shall be buried where reasonably feasible.	

Wind Facility and Collector Lines Setback Categories	Setback Conditions as Represented in Recent Site Permits	Pipestone County (Section 5-10, Subsections E, F and G) <u>Wind Turbine</u>	Pipestone County (Section 5-10, Subsections E, F and G) <u>Met Tower</u>
ELECTRICAL COLLECTOR AND FEEDER LINES	<p>Collector lines that carry electrical power from each individual transformer associated with a wind turbine to an internal project interconnection point shall be buried underground. Collector lines shall be placed within or adjacent to the land necessary for turbine access roads unless otherwise negotiated with the affected landowner(s).</p> <p>Feeder lines that carry power from an internal project interconnection point to the Project substation or interconnection point on the electrical grid may be overhead or underground. Feeder line locations shall be negotiated with the affected landowner(s).</p> <p>Any feeder lines that parallel public roads shall be placed within the public ROW or on private land immediately adjacent to public roads. If feeder lines are located within public ROW, the Permittee shall obtain approval from the governmental unit responsible for the affected ROW.</p> <p>Collector and feeder line locations shall be located in such a manner to minimize interference with agricultural operations, including, but not limited to, existing drainage patterns, drain tile, future tiling plans, and ditches. Safety shields shall be placed on all guy wires associated with overhead feeder lines. The Permittee shall submit the engineering drawings of all collector and feeder lines in the site plan.</p> <p>The Permittee must fulfill, comply with, and satisfy all IEEE standards applicable to this Project, including but not limited to, IEEE 776 [Recommended Practice for Inductive Coordination of Electric Supply and Communication Lines], IEEE 519 [Harmonic Specifications], IEEE 367 [Recommended Practice for Determining the Electric Power Station Ground Potential Rise and Induced Voltage from a Power Fault], and IEEE 820 [Standard Telephone Loop Performance Characteristics] provided the telephone service provider(s) have complied with any obligations imposed on it pursuant to these standards. Upon request by the Commission, the Permittee shall report to the Commission on compliance with these standards</p>	All communications and feeder lines, equal to or less than 34.5 kV in capacity, installed as part of a WECS shall be buried where reasonably feasible. Feeder lines installed as part of a WECS shall not be considered an essential service. This standard applies to all feeder lines subject to Pipestone County authority.	
OTHER RIGHTS-OF-WAY (RAILROADS, POWER LINES, ETC)		1.1 times total height.	The fall zone, as certified by a professional engineer + 10 feet (3 meters) or 1.1 times the total height. Minimum 250 feet (76 meters).

Wind Facility and Collector Lines Setback Categories	Setback Conditions as Represented in Recent Site Permits	Pipestone County (Section 5-10, Subsections E, F and G) <u>Wind Turbine</u>	Pipestone County (Section 5-10, Subsections E, F and G) <u>Met Tower</u>
NEIGHBORING DWELLINGS ³		750 feet (229 meters) and/or sufficient distance to meet state noise standards, whichever is greater.	The fall zone, as certified by a professional engineer + 10 feet (3 meters) or 1.1 times the total height. Minimum 250 feet (76 meters).
OTHER EXISTING WECS ⁴		3 RD on east-west axis and 5 RD on north-south axis.	N/A
PROPERTY LINES		3 RD on east-west axis and 5 RD on north-south axis.	The fall zone, as certified by a professional engineer + 10 feet (3 meters) or 1.1 times the total height. Minimum 250 feet (76 meters).
BLADES		Rotor blades or airfoils must maintain at least 30 feet (9 meters) of clearance between their lowest point and the ground.	

³ The setback for dwellings shall be reciprocal in that no dwelling shall be constructed within 750 feet (229 meters) of a commercial wind turbine.

⁴ Waived for internal setbacks in multiple turbine projects, including aggregated projects.

Wind Facility and Collector Lines Setback Categories	Setback Conditions as Represented in Recent Site Permits	Pipestone County (Section 5-10, Subsections E, F and G) <u>Wind Turbine</u>	Pipestone County (Section 5-10, Subsections E, F and G) <u>Met Tower</u>
INTERFERENCE	The Permittee shall not operate the project so as to cause microwave, television, radio, telecommunications, or navigation interference in violation of Federal Communications Commission regulations or other law. In the event the project or its operations cause such interference, the Permittee shall take timely measures necessary to correct the problem.	The applicant shall minimize or mitigate interference with electromagnetic communications, such as radio, telephone, microwaves, or television signals cause by any WECS. The applicant shall notify all communication tower operators within five miles of the proposed WECS location upon application to the county for permits. No WECS shall be constructed so as to interfere with County or Minnesota Department of Transportation microwave transmissions.	Same as Pipestone County Wind Turbine.
ELECTRICAL CODES AND STANDARDS	The Project and associated facilities shall be designed to meet or exceed all relevant local and state codes, Institute of Electrical and Electronics Engineers, Inc. standards the National Electric Code, the National Electric Safety Code, and North American Electric Reliability Corporation requirements. The Permittee shall report to the Commission on compliance with these standards upon request.	All WECS and accessory equipment and facilities shall comply with the National Electrical Code and other applicable standards.	Same as Pipestone County Wind Turbine.

8.2.3 Current and Future Zoning

The Pipestone County Zoning Ordinance applies only to unincorporated areas of Pipestone County. Each nearby city (Ruthton and Holland) has its own ordinance, however, the entire Project Area occurs outside of these incorporated areas and all project infrastructure will be sited at least one mile from incorporated areas. Urban expansion areas, depicted on **Map 5 (Zoning Map)**, are designated to the north and south of Holland and these expansion areas are outside of the Project Area.

To regulate land use, the Pipestone County Zoning Ordinance establishes nine separate zoning districts. Table 8.2.1.1, below, defines the nine zoning districts and indicates the two of those that fall within the Project Area (the Agricultural District and the Special Protection Shoreland District).

Table 8.2.3 Pipestone County Zoning Districts, Zoning Intent, and Zoning Districts

ZONING DISTRICT	DESCRIPTION OF ZONING INTENT	ZONING DISTRICTS WITHIN LAKE BENTON WIND II PROJECT AREA
<i>Flood Plain District (F)</i>	The intent of this district is to encompass all of the properties within Pipestone County that lie within areas prone to flooding. These areas require special regulations, as they are necessary for the minimum protection of the public health and safety, and of property and improvements from hazards and damage resulting from floodwaters.	
<i>Agriculture District (A)</i>	The purpose of this district is to maintain, conserve and enhance agriculture land within the County. This land has a history of being tilled and used for agricultural purposes. The Agriculture District protects this land from unnecessary urban encroachment.	X
<i>Urban Expansion District (A-I)</i>	The primary purpose of this district is to conserve for a period of time, land for farming and other open space land uses located adjacent to or within close proximity of existing incorporated urban centers within Pipestone County. It is the intention of this district to defer urban development in such areas until public utilities and services can be economically and financially reasonable to install. It is also intended that the appropriate planning bodies jointly review the status of all areas within this district once per calendar year. At this time, it shall be determined whether or not any or all of any part of these areas should be transferred to some other appropriate land use.	
<i>Rural Residential District (R-A)</i>	It is the intent of this district to provide suitable areas of low density residential development in areas of existing development which occurs in unincorporated areas and where municipal (sewer and water) utilities or an approved community utility system is available or as substantially relates to the urban development pattern set forth in the Land Use Plan for Pipestone County.	

ZONING DISTRICT	DESCRIPTION OF ZONING INTENT	ZONING DISTRICTS WITHIN LAKE BENTON WIND II PROJECT AREA
<i>Natural Environment Shoreland (NES)</i>	The purpose of this district is to preserve and enhance shoreland areas, retain high quality water standards, protect these areas from pollution, to protect shorelands which are unsuitable for development, to maintain a low density of development, and to maintain high standards of quality for permitted development.	
<i>Special Protection Shoreland District (SP)</i>	The intent of this district is to guide the development and utilization of shorelands of public waters for the preservation of water quality, natural characteristics, economic values, and the general health, safety, and welfare of all public waters in the unincorporated areas of the County. Further, the purpose of this district is to manage areas unsuitable for development due to wet soils, steep slopes, or large areas of exposed bedrock; and to manage areas of unique natural and biological characteristics in accordance with compatible uses.	X
<i>Recreation Commercial District (RC)</i>	This district is intended to provide suitable locations for, and to encourage the development of commercial recreation facilities in these areas of the County which benefit the recreational needs of both residents and tourists, will avoid land use conflicts with residential areas, and restrict incompatible commercial and industrial uses.	
<i>Highway Commercial District (HC)</i>	The purpose of this district is to provide a district that allows for a wide range of services and goods in a compact and convenient limited highway-oriented business closely related to existing urban areas or major transportation routes. Such developments are to be developed at standards that will not impair the traffic-carrying capabilities of abutting roads and highways.	
<i>Industry District (I)</i>	The intent of this district is to provide a district that will allow compact, convenient industry adjacent to existing urban areas in the County and will do so at standards that will not impair traffic-carrying capabilities of abutting roads and highways. This district will provide locations for industry that provide both adequate and essential utilities and insure a functional relationship among various types of land use.	

Source: Pipestone County Zoning Ordinance (Pipestone County 2017)

As indicated above, of the nine zoning designations, two occur within the Lake Benton Wind II Project Area: Agricultural District (A) and Special Protection Shoreland District (SP). The SP Districts within the Project Area are associated with Redwood River, North Branch Pipestone

Creek, Rock River, and East Branch Rock River. In order to comply with the Pipestone County Zoning Ordinance, Lake Benton Wind II has sited all turbines within the Agricultural District, avoiding SP locations. If SP locations need to be crossed by the collection system, Lake Benton Wind II will coordinate with Pipestone County to ensure compliance with all zoning regulations and acquire all appropriate permits, if applicable. Refer to **Map 5 (Zoning Map)** for the location of all zoning districts within the Project Area.

Lake Benton Wind II has sited all Project infrastructure at least one mile from incorporated areas and Urban Expansion Districts to minimize potential impacts on future urban growth. The proposed Project will be compatible with the rural, agricultural character of Pipestone County and the goals and policies regarding urban growth set forth in the County's comprehensive plan.

8.2.4 Conservation Easements

A variety of programs exist whereby landowners can sell or donate an easement to state, federal or non-governmental organizations to meet conservation objectives. Some of these programs include the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Reinvest in Minnesota (RIM) program, Wetlands Reserve Program (WRP) and Permanent Wetland Preserves (PWP) Program. These programs have varying requirements including length of time parcels are protected, annual lease rate, and type of habitat protected.

Review of the Project Area identified five CREP easements and two PWP easements (Minnesota Board of Water and Soil Resources 2017). Refer to table 8.2.2 below for additional details on these parcels.

Table 8.2.4 Conservation Easements

Conservation Program	Acreage within Project Area	Location	Expiration Year
CREP	22 acres (9 hectares)	Northern half of Project Area, near the eastern boundary.	Not Indicated
CREP	4.6 acres (1.9 hectares)	Northern half of Project Area, near the eastern boundary.	2052

Conservation Program	Acreage within Project Area	Location	Expiration Year
CREP	20.8 (8.4 hectares)	Northeast corner of Project Area, adjacent to eastern boundary.	Not Indicated
CREP	69.6 (28.2 hectares)	Northern half of Project Area, near the eastern boundary.	Not Indicated
CREP	77.9 (31.5 hectares)	Northern half of Project Area, near the eastern boundary.	Not Indicated
PWP	0.7 (0.3 hectares)	Within the western portion of the Project Area, adjacent to the western boundary.	Not Indicated
PWP	2.5 (1.0 hectares)	Within the western portion of the Project Area, adjacent to the western boundary.	Not Indicated

The two PWP properties within the western portion of the Project Area cover a total of 3.2 acres (1.3 hectares), with an additional 151.8 acres (61.4 hectares) extending outside of the Project Area to the west. No RIM properties are present in the Project Area.

Lake Benton Wind II will continue to work to obtain information on any CRP easements that may exist within the Project Area. Further, Lake Benton Wind II will attempt to avoid and preserve CRP easements to the maximum extent practicable if a landowner is found to have such an easement on their property.

8.2.5 Potential Impacts

The Lake Benton Wind II Project is consistent with Pipestone County's zoning requirements and comprehensive plan. The Pipestone County Zoning Ordinance Section 5-10 (D) allows for the construction and operation of commercial scale wind energy facilities within the Agricultural District. Thus, the Project is consistent with Pipestone County zoning. Additionally, while the SP District is present within the Project Area, no turbines or associated facilities are proposed within this district. No Project infrastructure is planned within the SP District; however, if at a later date infrastructure is proposed to be placed with the SP District, Lake Benton Wind II would request permission to place infrastructure in the SP District from Pipestone County and obtain required permits.

Lake Benton Wind II is not likely to impact future zoning and expansion of incorporated areas near the Project Area. Lake Benton Wind II has sited all Project infrastructure at least one mile from incorporated areas and Urban Expansion Districts to minimize potential impacts on future urban growth. Development of the Project will allow continued agricultural use of the Project Area, while helping to strengthen the local economy through annual payments to landowners with Project infrastructure on their property, potential use of local contractors and suppliers, potential temporary jobs for local workers and tax benefits to local governments.

Temporary and permanent impacts to current land use are anticipated to occur from the construction of the Project. As the Project is primarily located within the Agricultural District of Pipestone County, land use primarily consists of agricultural activity, including row cropping and livestock production. Temporary and permanent impacts to agricultural activities will include the removal of land from row crop production and pasture during the construction and operation of the Project. Additionally, temporary and permanent impacts to pastureland are expected to be minimal and restricted to removing small amounts of land from use.

The locations of the CREP and PWP easements have been incorporated into Project planning so that these locations will be avoided and not disturbed by Project activities. No Project infrastructure or construction easements will be located in CREP or PWP areas. Refer to **Map 6 (Public Land Ownership & Recreation)**. CRP easements will be located in coordination with participating landowners. If CRP easements are determined to be present, the locations will be incorporated into Project planning as it relates to turbine and road layout, and any other associated construction activities and these lands will be avoided to the maximum extent practicable. If the Project requires the placement of permanent infrastructure within CRP land, the Applicant will work with the landowner to remove the land from the CRP program and will cover the costs of any penalties incurred due to the removal of the easement from the program.

8.2.6 Mitigation Measures

Lake Benton Wind II does not propose any mitigation measures based on the comprehensive plans, land use planning and local zoning as negative impacts are not anticipated. Impacts to

conservation easements are not expected. CREP and PWP lands will be avoided and Lake Benton Wind II will verify whether any CRP easements are located within areas where infrastructure is planned. If CRP easements are unavoidable, Lake Benton Wind II will collaboratively work with the appropriate agency, as well as the landowner, to remove the impacted portion of the parcel from the conservation program and Lake Benton Wind II will cover the costs of any penalties incurred due to the removal of the parcel from the conservation program.

Additional mitigation for impacts to existing land use are further described in Sections 8.16, 8.17, 8.18, 10.2, 10.3, and 10.5.

8.3 Sound

Sound levels are measured and quantified using the logarithmic decibel (dB) scale. The decibel scale is logarithmic to accommodate the wide range of sound intensities found in the environment. Every 3-dB change in sound level represents a doubling or halving of sound energy and a change in sound levels of less than 3 dB is imperceptible to the human ear.

A sound level meter (SLM) that is used to measure sound is a standardized instrument per ANSI S1.4-1983 (R2006). It contains “weighting networks” (*e.g.*, A-, C-, Z-weightings) to adjust the frequency response of the instrument. Frequencies, reported in Hertz (Hz), are detailed characterizations of sounds, often addressed in musical terms as “pitch” or “tone”. The most commonly used weighting network is the A-weighting because it most closely approximates how the human ear responds to sound at various frequencies. The A-weighting network is the accepted scale used for community sound level measurements; therefore, sounds are frequently reported as detected with a sound level meter using this weighting. These sound levels are reported in decibels designated as “dBA”. Z-weighted sound levels are measured sound levels without any weighting curve and are otherwise referred to as “unweighted”.

Because the sounds in our environment vary with time they cannot simply be described with a single number. Two methods are used for describing variable sounds. These are exceedance levels and the equivalent level, both of which are derived from a large number of moment-to-moment A-weighted sound level measurements. Exceedance levels are values from the cumulative amplitude distribution of all of the sound levels observed during a measurement period. Exceedance levels are designated L_n , where n can have a value between 0 and 100 in terms of percentage. Several sound level metrics that are reported in community sound monitoring are described below.

- L_{10} is the sound level exceeded only 10 percent of the time. It is close to the maximum level observed during the measurement period. The L_{10} is sometimes called the intrusive sound level because it is caused by occasional louder sounds like those from passing motor vehicles.

- L_{50} is the sound level exceeded 50 percent of the time. It is the median level observed during the measurement period. The L_{50} is affected by occasional louder sounds like those from passing motor vehicles; however, it is often found comparable to the equivalent sound level under relatively steady sound level conditions.
- L_{90} is the sound level exceeded 90 percent of the time during the measurement period. The L_{90} is close to the lowest sound level observed. It is essentially the same as the residual sound level, which is the sound level observed when there are no obvious nearby intermittent sound sources.
- L_{eq} , the equivalent level, is the level of a hypothetical steady sound that would have the same energy (*i.e.*, the same time-averaged mean square sound pressure) as the actual fluctuating sound observed. The equivalent level is designated L_{eq} and is typically A-weighted. The equivalent level represents the time average of the fluctuating sound pressure, but because sound is represented on a logarithmic scale and the averaging is done with linear mean square sound pressure values, the L_{eq} is mostly determined by loud sounds if there are fluctuating sound levels.

The Project is subject to sound level requirements in Minn. R. Ch. 7030 for Noise Pollution Control. These rules are enforced by the MPCA through the use of Noise Area Classifications (NAC) that are defined in subpart 2 of Section 7030.0050 in terms of land use. The noise standards for each NAC are defined in subpart 2 of Section 7030.0040 as shown below in Table 8.3:

Table 8.3: MPCA State Noise Standards – Hourly A-Weighted Decibels

Noise Area Classification	Daytime		Nighttime	
	L50	L10	L50	L10
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

The above sound levels are total sound levels. Total sound levels include contribution from any sound sources in the environment, existing, and Project-related. NAC 1 receptors are protected by the lowest sound level limits of the MPCA. Since wind turbines can operate under conditions resulting in maximum sound power during both the day and at night, the Project would need to comply during the period with more stringent limits, nighttime. Furthermore, because wind turbine sound is generally steady during a relatively constant wind speed there would be minimal difference (*i.e.*, < 5 dBA) between the L_{50} and L_{10} sound levels due to a wind turbine. As the L_{50} and L_{10} noise limits differ by 5 decibels, the L_{50} limit is more restrictive for a wind energy facility. Therefore, NAC 1 receptors have been evaluated against the L_{50} sound level limit of 50 dBA in this analysis.

8.3.1 Description of Resources

The region is currently home to multiple existing wind energy facilities. Some wind turbines, currently owned and operated by NEER, will be decommissioned (“existing NEER” wind turbines) before construction of the Lake Benton Wind II Project. Other existing wind turbines in the vicinity of the Project are not owned or operated by Lake Benton Wind II, NEER, or its affiliates or subsidiaries and it is assumed that these wind turbines “existing non-NEER” will remain operational. These include: McBeth Wind, Moraine I Wind, Moraine II Wind, Shane’s Wind Machine, and Tholen Wind. Non-NEER wind turbines also exist outside the Project Area to the north. Existing NEER and non-NEER wind turbine locations within the Project Area and existing non-NEER wind turbine locations outside the Project are shown on **Map 7 (Aerial Locus of Existing Wind Turbines)**.

An ambient sound level survey was conducted to characterize the current acoustical environment in the community surrounding and within the Project Area. Existing sound sources include: NEER and non-NEER operational wind turbines, vehicles on Highway 23 (including trucks) and on other local roads, wind, animals including: dogs, cows, and coyotes, some rustling vegetation, occasional distant aircraft, occasional trains, and birds.

Ambient sound levels were measured at five locations for one week following methodology in the LWECS Guidance document based on a preliminary wind turbine layout. The DOC requested that additional measurements close to State Highway 23 be taken without the contribution from existing wind turbines. Since no access permission had been granted at an alternate residential location near Hwy 23, short-term off-site measurements were performed alongside the road during a daytime and a nighttime period. Following commencement of the measurement program, it was ascertained that no pre-determined long-term measurement location would be in absence of wind turbine sound contribution. Accordingly, additional short-term measurements were performed at off-site locations that do not have existing wind turbine sound contribution. See **Map 8 (Sound Level Measurement Locations)** for a review of all monitoring locations with respect to the Project. Result summaries of the long-term and short-term measurements are provided in Table 8.3.1a and Table 8.3.1b, respectively. Further details of the measurement locations, methodology, and sound levels are provided in **Appendix C (Pre-construction Sound Analysis)**.

Table 8.3.1a: Long-term Ambient Sound Level Summary

Long-term Measurement Location	Sound Pressure Level (dBA)			
	Min L10	Max L10	Min L50	Max L50
LT-1	22	64	19	61
LT-2	36	67	26	64
LT-3	33	60	28	55

Long-term Measurement Location	Sound Pressure Level (dBA)			
	Min L10	Max L10	Min L50	Max L50
LT-4	21	56	17	52
LT-5	18	58	17	54

Table 8.3.1b: Short-term Ambient Sound Level Summary

Short-term Measurement Location	Sound Pressure Level (dBA)			
	Daytime L10	Nighttime L10	Daytime L50	Nighttime L50
ST-1	66	47	53	30
ST-2	39	31	36	24
ST-3	35	31	28	26
ST-4	45	25	40	22

The sound impacts associated with the proposed wind turbines were predicted using the Cadna/A sound level calculation software developed by DataKustik GmbH. This software uses the ISO 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation). The sound level analysis for the Project conservatively includes 48 wind turbines, of which four (4) are considered alternate locations. Of these 48 wind turbines, 37 wind turbines are GE 2.3-116 units, six (6) are GE 2.3-116 Low Noise Trailing Edge (LNTE) units, two (2) are GE 2.1-116 units, and three (3) are GE 2.1-116 LNTE units. LNTE units include serrations on the blades to reduce audible noise created from turbines by disrupting the rate at which turbulent air compounds which results in lower pressure fluctuations. Sound power levels from GE technical reports for the GE 2.3 wind turbine were used to assign worst-case sound power levels to each of the modeled wind turbines. Sound levels provided for the GE 2.3-116 wind turbines have been used for the GE 2.1 model in this analysis. As the technical documents have been labeled as confidential by GE, the specific sound power levels are not presented in this application. This Project will not result in any new significant sound sources at the points of interconnect.

As discussed, the Project Area currently contains Lake Benton Wind II and non-NEER wind turbines. The existing Lake Benton Wind II wind turbines will be decommissioned before construction of the Project, however the non-NEER wind turbines are assumed to remain as operational. To predict the future wind turbine sound levels in the vicinity of the Project, a cumulative modeling analysis was conducted which included the sound level contribution from these existing non-NEER turbines. Of the 27 non-NEER wind turbines within the Project Area, 18 were assumed to be GE 1.5-70.5 units and 9 were assumed to be Vestas V82-1.65 units. This

modeling scenario therefore included a total of 75 wind turbines (48 Project-related, 27 existing non-NEER). The WindPRO software package provided sound power levels for the existing non-NEER wind turbines to represent “worst-case” emissions.

Receptors within 2 miles of the Project Area (234) were input into the Cadna/A model. These receptors were modeled as discrete points at a height of 1.5 meters above ground level to mimic the ears of a typical standing person and were all assigned as NAC 1. Participation status for each modeling receptor was assigned. All modeling receptors are identified on **Map 9 (Sound Level Modeling Locations)** and are distinguished as either participating, participation pending, or non-participating. Parcels not identified as participating but contain proposed wind turbines are assigned as “participation pending” status. Any non-“participating” parcel that was within or partially within the 5 by 3 setbacks has been assigned a “participation pending” status.

Several modeling assumptions inherent in the ISO 9613-2 calculation methodology, or selected as conditional inputs by Epsilon, were implemented in the Cadna/A model to ensure conservative results (*i.e.*, higher sound levels). No uncertainty factor was provided by the wind turbine manufacturers; however, based on experience with other wind turbine manufacturers and wind turbine sound modeling, an uncertainty factor of 2.0 dBA was assumed and added to the sound power level for each modeled wind turbine (Project and existing non-NEER).

8.3.2 Potential Impacts

All modeled sound levels, as output from Cadna/A, are A-weighted equivalent sound levels (L_{eq} , dBA). Based on Epsilon’s experience in conducting post-construction sound level measurement programs for wind energy facilities, the equivalent sound level has been comparable to the median (L_{50} , dBA) sound level when the wind turbine sound was prevalent and steady under ideal wind and operational conditions. Therefore, the modeled sound levels may be considered as L_{50} sound levels and directly compared to the Minnesota L_{50} limit.

The predicted worst-case sound level from the combination of the Project wind turbines and the existing non-NEER wind turbines (Project + Non-NEER) is below the 50 dBA limit at all modeled NAC 1 receptors as shown in Table 8.3.2. Modeled sound level isolines are presented on **Map 10 (Project and Existing Non-NEER L_{50} Sound Level Modeling Results)** for the Project + Non-NEER scenario. The highest L_{50} sound level is 49 dBA at receptors #775, #717, #706, and #707. These are all at non-participating receptors. Accordingly, total sound levels (Project + existing non-NEER wind turbines + non-wind-turbine ambient) will meet the Minnesota limit of 50 dBA when non-wind-turbine ambient sound levels are less than or equal to 44 dBA.⁵ Short-term nighttime measurements showed non-wind-turbine ambient L_{50} (dBA) sound levels to be well below 44 dBA under low ground-level wind speeds and ranging from just

⁵ The maximum modeled Project + Non-NEER L_{50} sound level is 49.3 dBA at receptor #775. $49.3 \text{ dBA} + 44.0 \text{ dBA} = 50.4 \text{ dBA}$. 50.4 dBA rounds to the whole decibel value of 50 dBA.

below to above the cut-in wind speed at hub height. Non-wind-turbine ambient sound levels in the Project Area fluctuate due to sound sources such as ground-level winds, vehicular traffic, and vegetation rustle, all of which can cause non-wind-turbine ambient sound levels to exceed the MPCA L₅₀ nighttime limit of 50 dBA.

There are four locations, #775, #717, #706, and #707, which are modeled to have a wind turbine L₅₀ sound level (Project + Existing Non-NEER) of 49 dBA. In all four instances, the primary sound source is an existing Non-NEER wind turbine. Existing Non-NEER wind turbine sound levels are presented on **Map 11 (Existing Non-NEER L₅₀ Sound Level Modeling Results)**. In addition, in each case, the wind turbine is on the parcel with the modeling receptor. The next highest non-participating residence is receptor #674 which is modeled to be 47 dBA (Project + Existing Non-NEER); this is several decibels below the MPCA L₅₀ nighttime limit.

Moreover, the highest predicted worst-case Project Only L₅₀ sound level at a modeling receptor is 47 dBA and, therefore, meets the most restrictive MPCA sound limit of 50 dBA. This is at receptor #735 which is participating. The highest Project Only L₅₀ sound level at a non-participant is 45 dBA (receptor #826). Modeled sound level isolines are presented in **Map 12 (Project-Only L₅₀ Sound Level Modeling Results)** for the Project Only scenario.

Table 8.3.2 presents a summary of the Project + Existing Non-NEER and Project Only sound level modeling results. Appendix C (Pre-construction Sound Analysis) provides further details of the sound modeling analysis.

Table 8.3.2: Summary of Sound Assessment

Modeling Scenario	Maximum Modeled L ₅₀ Sound Pressure Level (dBA) at NAC 1 Receptors			
	All Receptors	Participating	Participation Pending	Non-Participating
Project + Existing Non-NEER	49	48	48	49
Project Only	47	47	47	45

An evaluation of low frequency (LF) and infrasound levels from a wind energy center at receptors is not required by the State of Minnesota. However, a discussion of LF and infrasound, as it pertains to wind turbines, is provided below for informational purposes.

Low frequency and infrasound are present in the environment due to other sources besides wind turbines. For example, refrigerators, air conditioners, and televisions generate infrasound and low frequency sound. The frequency range of low frequency sound is generally from 20 Hz to 200 Hz, and the range below 20 Hz is often described as “infrasound”. However, audibility can

extend to frequencies below 20 Hz if the energy is high enough. Since there is no sharp change in hearing at 20 Hz, the division between “low-frequency sound” and “infrasound” should only be considered “practical and conventional.” The threshold of hearing is standardized for frequencies down to 20 Hz (International Organization for Standardization (ISO) 2003). Based on extensive research and data, Watanabe and Moeller have proposed normal hearing thresholds for frequencies below 20 Hz (Watanabe and Moeller 1990). These sound levels are so high that infrasound is generally considered inaudible. For example, the sound level at 8 Hz would need to be 100 dB to be audible.

A detailed infrasound and low frequency noise measurement program of wind turbines was conducted from 2013-2015 by the Ministry for the Environment, Climate and Energy of the Federal State of Baden-Wuerttemberg, Germany (Herrmann et al. 2016). The conclusions of the German study were:

Infrasound and low-frequency noise are an everyday part of our technical and natural environment. Compared with other technical and natural sources, the level of infrasound caused by wind turbines is low. Already at a distance of 150 m (~500 ft), it is well below the human limits of perception. Accordingly, it is even lower at the usual distances from residential areas. Effects on health caused by infrasound below the perception thresholds have not been scientifically proven. Together with the health authorities, we in Baden-Württemberg have come to the conclusion that adverse effects relating to infrasound from wind turbines cannot be expected on the basis of the evidence at hand.

The Massachusetts Department of Environmental Protection (MA DEP) and the Massachusetts Department of Public Health (2016) commissioned an expert panel who found that: “Claims infrasound from wind turbines directly impacts the vestibular system have not been demonstrated scientifically. Available evidence shows that the infrasound levels near wind turbines cannot impact the vestibular system.”

Health Canada, in collaboration with Statistics Canada, conducted one of the most extensive studies to understand the impacts of wind turbine noise to-date (Health Canada 2013). A cross-section epidemiological study was carried out in 2013 in the provinces of Ontario and Prince Edward Island on randomly selected participants living near and far from operating wind turbines. Many peer-reviewed publications have been written based on the Health Canada research, including an analysis of low frequency and infrasound data. For example, Keith et al. concluded that there was no advantage of using C-weighting to measure low frequency sound since the relationship between A-weighting and C-weighting are so highly correlated (Keith et al. 2016). In other words, acceptable A-weighted limits also eliminate low frequency and infrasound impacts.

Low frequency and infrasound has also been studied extensively in Japan. Tachibana et al. conducted extensive measurements of 34 wind farms nationwide and concluded that infrasound

from wind turbines is not audible/sensible, and that wind turbine noise is not a problem in the infrasound region (Tachibana et al. 2014).

As noted in the 2011 National Association of Regulatory Utility Commissioners (NARUC) report (NARUC 2011), “the widespread belief that wind turbines produce elevated or even harmful levels of low frequency and infrasonic sound is utterly untrue as proven repeatedly and independently by numerous investigators.”

8.3.3 Mitigation Measures

Lake Benton Wind II has designed the Project to meet the MPCA state noise standards and to minimize the sound levels due to the wind turbines at the homes in the community as much as possible, while also meeting the other constraints of the project design and regulatory requirements.

Compliance with MPCA noise standards will be accomplished, in part, by including in its design a 1,400 setback from residences. Also, consistent with the 3 RD X 5 RD setback, turbines will be set back from non-participating properties by a minimum setback of at least 1,147 feet (350 meters or 3 RD) in the non-prevailing wind direction and at least 1,911 feet (583 meters or 5 RD) in the prevailing wind direction. In addition, the Applicant will also conduct a post-construction sound level measurement program to evaluate compliance with respect to MPCA noise standards.

8.4 Visual Impacts

8.4.1 Description of Resources

Aesthetic quality and appeal of a region generally derive from the terrain, natural features (*e.g.*, lakes, rivers, ponds, etc.), native flora, and cultural features that define the landscape. Individual observers will have differing opinions on the aesthetic appeal of a region and impacts that may alter the quality. Those likely to be viewing the proposed Project include permanent observers (residents) and temporary observers (motorists, tourists, or recreationalists passing by or using the area intermittently). Residents within and in the vicinity of the Project Area are expected to have a higher sensitivity to the potential aesthetic impacts than temporary observers as they will look at the Project more frequently than those individuals periodically passing through the area.

The general topography of the Project Area is described as undulating, rolling relief with approximate elevations between 1,790 and 1,960 feet (546 and 597 meters) above mean sea level (MSL). Refer to **Map 13 (Topographic Map)**. The Project Area generally has higher elevations in the central and northwestern sections with lower elevations in the northeast, southeast, and southwest. Agricultural fields, farmsteads, grasslands, and rolling topography visually dominate the Project Area. The landscape can generally be classified as rural open space.

Vegetation within the Project Area is predominantly agricultural crops, pasture, and wooded shelter belts surrounding residences and riparian areas. The main agricultural crops grown in this vicinity include corn and soybeans. Settlement in this area of Pipestone County includes residential and farm buildings scattered along rural county and township roads. There are 107 residences located throughout the Project Area. Additionally, the Town of Ruthton and associated clustered residences is located 0.9 miles (1.5 kilometers) east of the Project Area.

The main visual focal points within the Project Area are aspects of an agricultural landscape, which are broken up by residences, buildings, shelter belts, and small wooded lots. Viewsheds in the area are generally long and open with only small scattered areas where the view from a location would be blocked by vegetation, topography, or existing structures. Cemeteries are not located within the Project Area; however, two cemeteries are located within one mile of the Project Area (Holland Cemetery and Ruthton Cemetery).

The existing Lake Benton Wind II wind farm occurs within the Project Area and consists of 137 existing turbines distributed throughout the Project Area, which generate 0.75 MW each. This existing project will be decommissioned prior to the commercial operation of the proposed Project. There are a total of 27 wind turbines within the Project Area that are not owned by the Applicant or another NEER subsidiary. These turbines appear to be in commercial operation and Lake Benton Wind II is unaware of plans for these turbines to be decommissioned in the near future. The existing McBeth Wind, Tholen Wind, and Shane Cowell wind sites occur within the southeast portion of the Project Area and portions of the existing Moraine I and Moraine II wind farms occur within the southeast portion of the Project Area and continue off-site to the southeast. These existing wind facilities contain turbines of various heights and rotor diameters.

- The Tholen wind farm consists of five turbines that generate 1.65 MW each.
- The McBeth wind farm consists of three turbines that generate 1.65 MW each.
- The Shane Cowell wind site consists of one wind turbine that generates 2.1 MW.
- The Moraine I wind farm consists of 34 turbines that generate 1.5 MW each.
- The Moraine II wind farm consists of 33 turbines that generate 1.5 MW each.

MET towers associated with these wind facilities may also be present on the landscape. Generally, wind energy conversion systems within and adjacent to the Project Area contain slightly smaller sized turbine models than those proposed for this Project, with total heights ranging from approximately 300 feet to approximately 400 feet (91 meters to approximately 122 meters). An additional 15 wind farms are located within 10 miles (16 kilometers) of the Project Area. Refer to **Map 14 (Existing Turbine Locations)**.

Existing transmission lines of 69 kV and higher are not present within the Project Area. One existing transmission line, the Chanarambie to Lake Yankton 115 kV, runs north to south approximately 1 mile to the east of the southeastern portion of the Project Area. An additional approximately 177 miles (285 kilometers) of existing transmission lines are located within ten

miles (16 kilometers) of the Project Area. Refer to **Map 2 and Map 2a**. No new transmission lines above 69 kV are proposed for this Project. Existing transmission lines create existing visual impacts to the Project Area viewshed.

The FCC Antenna Structure Registration database identifies one antenna structure within the Project Area and 22 existing antenna structures within ten miles of the Project Area creating existing visual impacts to the Project Area viewshed.

8.4.2 Visual Impacts

As the number of turbines associated with the Project repower will be reduced from 137 to 44 and no new transmission lines or overhead distribution lines are proposed for the Project, it is anticipated that the repower will have a net positive impact on aesthetics. Two turbine models, the GE 2.3 MW and GE 2.1 MW, are proposed for the Project. Both models will be similar in appearance with three blades, a hub, and a monopole. Both turbine models have a 116.5 meter (382.2 foot) RD and differ slightly in hub height; the GE 2.3 MW model has a hub height of 90 meters (295 feet) and the GE 2.1 model has a hub height of 80 meters (263 feet). Therefore, these two models differ in total height. Refer to Table 8.4.1 below. In general, the larger the RD, the fewer turbines are required to produce the same energy output, creating less of a visual impact. The RD of the existing Lake Benton II wind turbines currently located within the Project Area is approximately 50 meters (USGS 2014a). There are 137 existing Lake Benton wind turbines located in the Project Area which will be decommissioned, and only 44 wind turbines are proposed for the Project.

Table 8.4.2: Rotor Diameter and Number of Turbines

Turbine Model	Rotor Diameter (meters/feet)	Rotor Tip Height (meters/feet)	Ground Clearance (meters/feet)	Number of Turbines	Number of Alternate Turbines
GE 2.1 MW	116.5/382.2	138.3/453.7	22/72.2	5	0
GE 2.3 MW	116.5/382.2	148.3/486.6	32/105	39	4

The turbines will be uniform in color and painted with a non-reflective/off-white color designed to minimize visual impacts. The towers and blades, including those with LNTE, will be of a color, design, operation, and appearance consistent with other turbines in the area. No advertising or graphics will be placed on any part of the tower or blades; however, the turbines will be clearly numbered for identification and emergency response. The towers will not be

illuminated except as required by the FAA. The FAA requires obstruction lighting or marking of structures over 200 feet (61 meters) above mean sea level because they have the potential to obstruct air navigation. Lake Benton Wind II will request FAA approval of a lighting plan that is compliant with FAA requirements.

The proposed Project will be visible to permanent observers (residents) and temporary observers (motorists, tourists, or recreationalists passing by or using the area intermittently). Visual impacts may also be noticeable to users of public lands and public snowmobile trails within and in the vicinity of the Project Area. Further information regarding the public lands and snowmobile trails in relation to the Project Area is found in Section 8.7. However, the proposed Project will not be introducing a new feature type to the landscape because existing wind turbines are prevalent within and in the vicinity of the Project Area.

Turbines will likely be viewed in one of three perspectives:

- As a visual disruption;
- As generally compatible with the rural agricultural heritage of the area, which includes windmills, silos and grain elevators, and existing wind turbines; or
- As adding a positive aesthetic quality to the landscape.

The topography in the vicinity of the Project Area is rolling and the vegetation is low, and the Project will be visible to residents of the area and to people traveling northeast and southwest along Minnesota 23, north and south along US Hwy 75, east and west along Minnesota 30, and north to south along Minnesota 91. However, the proposed Project will not create a new feature type within the landscape because the existing Lake Benton II wind farm is already present on-site, and several wind farms occur within Project Area and its immediate vicinity. The 44 wind turbines proposed for the Project will replace the 137 existing Lake Benton II turbines being decommissioned. Although the proposed turbines are taller, there will be significantly fewer turbines within the Project Area.

Additionally, alterations of the land with temporary impacts related to construction activities, such as temporary land use associated with equipment staging and laydown areas, crane paths, and installation of underground collection lines would be short-term and converted back to cropland or replanted with grasses and vegetation native to the area following the completion of construction. Visual impacts from an increase in traffic and human activity within the Project Area associated with Project construction would also be short-term. The long-term operation of the Project is not anticipated to increase visual impacts associated with human activity or traffic within the Project Area.

8.4.3 Shadow Flicker

With respect to wind turbines, shadow flicker can be defined as an intermittent change in the intensity of light in a given area resulting from the operation of a wind turbine due to its

interaction with the sun. While indoors, an observer experiences repeated changes in the brightness of the room as shadows cast from the wind turbine blades briefly pass by windows as the blades rotate. In order for this to occur, the wind turbine must be operating, the sun must be shining, and the window must be within the shadow region of the wind turbine, otherwise there is no shadow flicker indoors. A stationary wind turbine only generates a stationary shadow similar to any other structure.

A Project-specific shadow flicker analysis was conducted using the software package, WindPRO and is presented in **Appendix D (Shadow Flicker)**. The worst-case annual duration of shadow flicker was calculated based on the following modeling inputs:

- Proposed wind turbine locations. The modeling analysis included 48 wind turbines (44 proposed + 4 alternates).
- Wind turbine dimensions, i.e., rotor diameter and hub height. A combination of GE 2.1 and GE 2.3 wind turbines are proposed for this Project.
- Discrete modeling points, i.e., sensitive receptors, including residences, hospitals, schools and other potential sensitive receptors. These locations are consistent with the NAC 1 receptors modeled in the sound level analysis. All modeling receptors and participation status are presented on **Map 15 (Shadow Flicker Modeling Locations)**. 234 receptors are included in the analysis.
- In addition to modeling discrete points, shadow flicker was calculated at grid points in the area surrounding the modeled wind turbines to generate flicker isolines. A 20-meter spacing was used for this grid.
- There are no federal, state, or local regulations regarding the maximum radial distance from a wind turbine to which shadow flicker should be analyzed applicable to this Project. Various approaches for defining a calculation area are discussed in the detailed report. Conservatively, this analysis includes shadow flicker calculations out to 1.25 miles (2,012 m) from each wind turbine in the model for the proposed layout.
- Shadow flicker durations were only calculated when the angle of the sun was at least 3° above the horizon.
- The terrain height contour elevations for the modeling domain were generated from elevation information derived from the National Elevation Dataset (NED) developed by the U.S. Geological Survey.
- Conservatively, obstacles (*i.e.*, buildings and vegetation) were excluded from the analysis. This is effectively a “bare earth” scenario which is conservative. When accounted for in the shadow flicker calculations, such obstacles may significantly mitigate or eliminate the flicker effect depending on their size, type, and location.

The WindPRO modeling was further refined by incorporating sunshine probabilities and wind turbine operational estimates by wind direction over the course of a year. The values produced

by this further refinement are known as the “expected” shadow flicker. Project specific inputs are presented below:

- Monthly sunshine probability values for each month from January to December. These numbers were obtained from a publicly available historical dataset for Sioux City, Iowa from the National Oceanic and Atmospheric Administration’s National Centers for Environmental Information shown in Table 8.4.3a.

Table 8.4.3a: Monthly Sunshine Probability Values

Month	Possible Sunshine
January	57%
February	57%
March	59%
April	59%
May	62%
June	70%
July	73%
August	70%
September	65%
October	60%
November	48%
December	48%

- A Lake Benton Wind II provided 31-year hourly time series for wind speed and wind direction at 90 meters above ground level was used to calculate the typical annual number of operational hours per wind direction sector. These hours per wind direction sector are used by WindPRO in the estimation of the “wind direction” and “operation time” reduction factors. Based on this dataset, the wind turbines would operate 98% of the year. Table 8.4.3b shows the distribution of operational hours for the 16 wind directions.

Table 8.4.3b: Operational Hours per Wind Direction Sector

Wind Sector	Operational Hours
N	668
NNE	495
NE	401

ENE	328
E	295
ESE	263
SE	318
SSE	507
S	1,122
SSW	895
SW	495
WSW	362
W	431
WNW	587
NW	708
NNW	710
Annual	8,585

The modeled worst-case annual shadow flicker duration ranged from 0 hours, 0 minutes per year to 91 hours, 55 minutes per year. The maximum flicker was at a receptor with pending participation (#1108). The maximum predicted annual flicker at a non-participating receptor (#849) is 54 hours, 49 minutes. **Map 16 (Shadow Flicker Modeling Results)** presents expected annual shadow flicker durations as isolines overlaid on aerial imagery. The predicted expected annual shadow flicker duration ranged from 0 hours, 0 minutes per year to 30 hours, 25 minutes per year. The maximum expected flicker was at a receptor with pending participation (#1108). The maximum modeled expected annual flicker at a non-participating receptor (#849) is 19 hours, 4 minutes. The majority of the receptors (170) were predicted to experience no annual shadow flicker. 34 locations were predicted to experience some shadow flicker but less than 10 hours per year. The modeling results showed that 29 locations would be expected to have 10 to 30 hours of shadow flicker per year. One receptor is expected to have over 30 hours of flicker per year. The modeling results are conservative in that modeling receptors were treated as “greenhouses” and the surrounding area was assumed to be without vegetation or structures (“bare earth”).

Summaries of the modeling results are presented in Tables 8.4.3c, 8.4.3d, and 8.4.3e. **Appendix D** to this application provides the complete shadow flicker study and results for the Lake Benton Wind II Project.

Table 8.4.3c: Predicted Shadow Flicker Impacts at Participating Residents

Statistic	Duration (hrs:mins/yr)
Maximum Shadow Flicker - Worst Case	78:17
Maximum Shadow Flicker - Expected Case	26:07

Table 8.4.3d: Predicted Shadow Flicker Impacts at Participation Pending Residents

Statistic	Duration (hrs:mins/yr)
Maximum Shadow Flicker - Worst Case	91:55
Maximum Shadow Flicker - Expected Case	30:25

Table 8.4.3e: Predicted Shadow Flicker Impacts at Non-Participating Residents

Statistic	Duration (hrs:mins/yr)
Maximum Shadow Flicker - Worst Case	54:49
Maximum Shadow Flicker - Expected Case	19:04

Based on the current design and operation of typical modern wind turbines, shadow flicker is not a cause of epileptic seizures. According to the Epilepsy Foundation (Epilepsy Foundation 2013), “Generally, flashing lights most likely to trigger seizures are between the frequency of 5 to 30 flashes per second (Hertz).” The wind turbines for this Project have a maximum rotational speed of 15.7 rpm which corresponds to a shadow flicker frequency of 0.8 Hz. This frequency is well below the frequency identified by the Epilepsy Foundation; therefore, the triggering of epileptic seizures is not a concern with this Project.

8.4.4 Mitigation Measures

The decommissioning of the existing 137 existing Lake Benton II wind turbines mitigates the visual impact of the Project’s proposed 44 replacement turbines as there will be far fewer

turbines visible on the Project Area landscape. Lake Benton Wind II will implement the following mitigation measures to minimize potential visual impacts:

- Turbines will be uniform in color;
- Turbines will not be located in sensitive areas such as public parks, Wildlife Management Areas (WMA), Scientific and Natural Areas (SNA) or Waterfowl Protection Areas (WPA);
- Turbines will be illuminated to meet the minimum requirements of FAA regulations for obstruction lighting of wind turbine projects;
- Electrical collection lines will be buried to minimize above-ground structures within the Project Area;
- Existing roads will be used for construction and maintenance, as appropriate, to minimize the number of new roads constructed; and
- Temporarily disturbed areas will be converted back to cropland or otherwise reseeded with seed mixes appropriate for the region.

The Project was designed to minimize shadow flicker exposure of the residences in the area. Lake Benton Wind II will use site specific mitigation measures to address shadow flicker impact, as appropriate, including the following:

- Meet with the homeowner to determine the specifics of their complaint;
- Investigate the cause of the complaint; and
- Provide the homeowner with reasonable mitigation alternatives including shades, blinds, awnings or plantings.

8.5 Public Services and Infrastructure

The Project is located in rural southwestern Minnesota (see **Map 1 - Project Location**). A network of roads and utilities provide access, electricity, water supply, and telephone service to rural residences, farmsteads, small industry, and unincorporated areas. Public services within the Project Area are provided by the Pipestone County Sheriff, Pipestone County Ambulance, Tyler Ambulance, Holland Fire Department, Ruthton Volunteer Fire Department, and the Lake Wilson Fire Department. An emergency response center in the City of Pipestone dispatches all 911 calls for the county, including for fire, medical and police emergencies. During pre-construction, construction, operations, and decommissioning, no external first responders are required or expected for any activities inside of Project wind turbine structures, including but not limited to medical or fire response. Lake Benton Wind II and its contractors are responsible for transporting a victim to ground level for hand off to local emergency personnel if the victim's condition warrants such assistance. Lake Benton Wind II personnel and contractors will be trained and appropriately equipped for high-angle rescue within turbines and all associated turbine components. The Project is expected to have a minimal effect on existing services and infrastructure and will be constructed and operated in accordance with associated federal, state

and local permits and laws. Industry construction and operation standards and best practices will also be followed. Extensive public service and infrastructure mitigation measures are not anticipated because only minor impacts to services and infrastructure are expected.

Lincoln Pipestone Rural Water provides the water supply within the Project Area and septic systems are typically used within the Project Area to provide household needs.

8.5.1 Traffic and Roads

Existing road infrastructure within the Project Area consists primarily of county and township roads that typically follow section lines, as well as farmstead driveways and farming access roads. The primary route through the Project Area is State Route 23 (TH 23), that travels in a northeast/ southwest orientation. Though not in the Project Area boundary, U.S. Highways 75 and 14 are the main access routes into the Project and to nearby communities. The county roads and township roads used to access the proposed Project access roads and turbine locations are either two-lane paved roads or gravel roads. A summary of roadways within the Project Area are found in Table 8.5.1.

Table 8.5.1: Summary of Roadways within Project Area

Road Type	Miles within Project Boundary (miles/km)
Federal Highways	0
State Highways	4.2/6.8
County Highways/Roads	38.1/61.3
Township Roads	24.6/39.6

Traffic within and around the Project Area has been summarized in Table 8.5.1a, below, based upon available MnDOT data (MnDOT 2016) TH 23 has the highest Average Annual Daily Traffic (AADT) count with 3,250 vehicles per day, using 2016 data, while the lowest traffic volume was CSAH 11 with 140 vehicles per day, using 2016 data. AADT data was not available for several roads within the Project Area, however, with the exception of TH 23, the AADT data ranged from 140 to 540 vehicles per day. Therefore, it can be inferred that roads lacking AADT data would likely support similar traffic, or potentially less traffic, per day.

Table 8.5.1a: Existing Daily Traffic Levels

Roadway Segment Description ¹	Approx. Miles Within Project Boundary	Traffic Volume	Year Data Collected
CSAH 7	1.36 (2.19 km)	180	2016
CSAH 8	1.00 (1.61 km)	145	2016
CSAH 10	5.35 (8.61 km)	385	2016
CSAH 11	5.00 (8.05 km)	140	2016
CSAH 16	4.11 (6.6 km)	200	2016
CSAH 18	5.31 (8.55 km)	540	2016
TH 23	4.22 (6.79 km)	3,250	2016

¹Roads included if AADT data was available. Several roads within the Project Area did not have AADT data. Source: MnDOT, (2016), Office of Transportation Data & Analysis, Traffic Volume Program, 2016 AADT Product

8.5.2 Telecommunications

A review of the Project was conducted by the U.S. Department of Commerce, National Telecommunications and Information Administration (NTIA) as part of the Project's Telecommunications Study in **Appendix E**. The NTIA provided the Project information to the Interdepartmental Radio Advisory Committee (IRAC) which includes 20 federal agency members. Confirmation was received on August 21, 2017 that no IRAC member agencies had issues with turbine placement in the Project Area.

Telephone

Telephone service in the Project Area is provided to farmsteads, rural residences, and businesses by Alltel Communications, AT&T Mobility Spectrum, Century Link, Cunningham Telephone, Mediacom, Vast Broadband, and Verizon Wireless. Eleven cellular towers were discovered within 25 kilometers (15.5 miles) of the Project Boundary. Refer to Table 8.5.2 for a summary of FCC licensed signals and tower within the vicinity of the Project Area.

Microwave Beam Paths

The **Appendix E** study examined microwave beam paths in the vicinity of the Project Area and identified two microwave towers in the Project Area and twelve microwave beam paths that cross into the Project Area. An additional 2 microwave beam paths were identified near the Project Area. These beam paths are owned and operated by Affiniti, LLC, State of Minnesota, Minnesota Valley Television Improvement Corporation, and the West Central Minnesota Educational TV Corporation. WindLogics calculated Worst Case Fresnel Zones (WCFZ), which are determined by the 2nd Fresnel zone radius obtained at the midpoint of the microwave link. Utilization of the WCFZ, and an offset to account for the blade length, enables turbines to be sited such that impacts to microwave beam paths are avoided (**Map 17 – Microwave Beam Path Map**). Refer to Table 8.5.2 for a summary of FCC licensed signals and towers within the vicinity of the Project Area.

AM/FM Radio

The **Appendix E** study did not identify active AM or FM radio towers within the Project Area. One AM tower and six FM towers were identified within 25 kilometers (15.5 miles) of the Project Area. The AM tower has the call sign KLOH and the FM towers have the call signs K257FP, KISD, KJOE, KKCK, KNSW, and KRSW. Refer to Table 8.5.2 for a summary of FCC-licensed signals and towers within the vicinity of the Project Area.

Fixed Land Mobile Stations

Land mobile stations are used within the Project Area for public safety, emergency response, and local government communications. Land mobile stations will also be used by Project staff for communication between maintenance and operation crews. Typically, land mobile stations are unaffected by wind projects as their radio systems are designed with multiple transmitters to provide redundancies that allow signals to broadcast through wind turbines.

Table 8.5.2: Summary of FCC-Licensed Signals and Towers in and within the Vicinity of the Project Area

Communication System Type	Number of Signals and Towers
AM (AM Radio Signals)	1
FM (FM Radio Signals)	6
Microwave (Radio Wave Transmissions)	14
Cellular (Towers)	11

8.5.3 Other Local Services

Existing transmission lines of 69 kV and higher are not present within the Project Area. Approximately 177 miles of existing transmission lines are located within 10 miles of the Project Area. One railroad is located within the Project Area. The Burlington Northern and Santa Fe Railway operate the railroad that traverses the central portion of the Project Area from northeast to southwest. One (1) 8" non-highly volatile liquid pipeline owned and operated by Magellan Pipeline Company, LP crosses through the center of the Project Area in a northeast to southwest orientation. No other pipelines were identified on publically available databases or mapping. The Applicant is conducting a detailed review to identify other potential pipelines, easements, and buried infrastructure within the Project construction easement.

8.5.4 Television

The **Appendix E** study determined that digital or analog television towers are not located in the Project Area. However, there are 15 licensed television towers within 100 kilometers (62.1 miles) of the Project Area; including one that is within 50 kilometers (31.1 miles) of the Project Area and likely to be broadcasting to the region. Most of the television towers within 100 miles of the Project Area are low power stations or translator stations that have a limited range and are not anticipated to experience reception degradation. Two full power stations (call signs KDLT-TV and KSMN) have a possibility of experiencing reception degradation if the Project is in line-of-sight. These towers are located 72.2 kilometers (44.9 miles) and 20.9 kilometers (13.0 miles) from the Project.

Table 8.5.4: Digital Television Signals In the Vicinity of the Project Area

Call Sign	Station	Licensee	Signal Strength (kw)
KCSD-TV	24	South Dakota Board of Directors for Educational Telecommunications	80.9
KDLT-TV	47	Red River Broadcast Co., LLC	589
KLEO-TV	11	Nexstar Broadcasting, Inc.	30
KESD-TV	8	South Dakota Board of Directors for	15

Call Sign	Station	Licensee	Signal Strength (kw)
		Educational Telecommunications	
KRWF	27	KSAX-TV, Inc.	58
KSFY-TV	13	Gray Television Licensee, LLC	22.7
KSMN	15	West Central Minnesota Educational TV Corporation	200
KTTW	7	Independent Communications, Inc.	7.5
KWSD	36	J.F. Broadcasting, LLC	36.9
K35GR-D	35	Red River Broadcast Co., LLC	11.9
K56GF	23	Digital Networks-Midwest, LLC	15
K56GF	56	Digital Networks-Midwest, LLC	10.1
KAUN-LP	42	J.F. Broadcasting, LLC	0.88
KCPO-LP	26	G.I.G., Inc.	7.57
KCWS-LP	44	J.F. Broadcasting, LLC	0.68

8.5.5 Potential Impacts

Traffic and Roads

Temporary impacts are expected to public roads during the construction phase of the Project as materials, personnel and equipment will be brought in via existing U.S. Highways, county roads, and township roads. U.S. Highways 75 and 14 and State Highway 23 are the main access routes into the Project and would likely be used as corridors to bring materials and equipment to the Project site; however, the exact routes will be determined closer to construction and in coordination with local jurisdictions as appropriate. Construction traffic is expected to generate approximately 500 trips per day during peak construction. Local roads can accommodate this additional traffic as the functional capacity of a two-lane paved rural highway is in excess of 5,000 vehicles per day. However, some minor, short-term traffic delays within and near the Project site may occur during turbine and equipment delivery and construction activities.

Additionally, public road and intersection improvements, as well as temporary access road approaches and turning radii, are required for transportation and turbine component delivery during the construction phase of the Project. Another temporary activity associated with construction is a temporary route required for oversized crane machinery movement between turbine assembly points (*i.e.*, crane walk). Large components of the turbines, including but not limited to the tower, blades, rotor, and generator, will be delivered to respective turbine sites for assembly in place. Once a turbine is constructed, the crane will be mobilized to access the next turbine assembly point. In order to minimize damage over roads, temporary base material, such as sand will be applied where the crane will cross. Road improvements and traffic delays associated with the Project will require coordination with appropriate agencies. Temporary and/or permanent culvert crossings within regulated features will be installed where necessary for permanent access roads, access road approaches, intersection improvements, and/or the crane walk path. Proper placement and sizing of culverts will require approval from the appropriate federal, state, and local agencies. Temporary culverts will be removed after construction and temporarily disturbed areas will be converted back to cropland or otherwise reseeded with native seed mixes appropriate for the region.

During operations, only a small maintenance crew will utilize roads within the Project Area for regular inspections and maintenance. Nearby county roads have AADTs between 140 and 540 and traffic is not expected to noticeably increase during the operations phase of the Project.

Telephone

The Project is not anticipated to impact telephone or internet services. Underground utilities, if any, will be located using a utility locate service and collection line locations will be coordinated with local telecommunications providers to ensure there will be no impact to existing telephone

lines or other underground utilities. The **Appendix E** study indicates that interference would not occur to cellular telecommunications.

Microwave Beam Paths

No impacts to microwave beam paths are anticipated in the Project Area. The **Appendix E** study calculated the WCFZ for microwave beam paths within the Project Area and added a 68-meter (223 feet) offset to reduce the probability of harmful interference. Turbines have been planned so as to avoid microwave beam paths and comply with the WCFZ offset. See **Appendix E**.

AM/FM Radio

The **Appendix E** study determined that interference to AM or FM signals are expected to be minimal. Some AM/FM signal loss may occur in close proximity to individual turbines, but most AM/FM radio receptors are expected to be near residences and residences will have sufficient setback to minimize signal interruptions. Interference to AM towers would be limited to a distance equal to one wavelength from non-directional antennas and 10 wavelengths, or three kilometers (1.9 miles), from directional antennas. The closest AM tower, KLOH, is located 18.5 kilometers (11.5 miles) from the Project Area and has a wavelength of 285.7 meters (937 feet). Thus, the Project Area is greater than 10 wavelengths from the closest tower and thus impacts are not anticipated. Wind turbines have minimal effect to FM frequencies near 100 MHz at distances over 100 meters (328 feet) from the tower. There is also a potential for FM stations to experience interference at distances closer than four kilometers (2.5 miles) from turbines. However, there are no FM towers within four kilometers (2.5 miles) of the Project Area and thus impacts to FM frequencies are not anticipated.

Fixed Land Mobile Stations

Impacts to fixed land mobile stations are not anticipated to occur as a result of Project construction.

Television

The **Appendix E** study examined impacts to television (TV) service. While impacts to television reception are still not well known, interference is expected to be limited to areas near a turbine that is within the line-of-site between a transmitting tower and a TV receptor, areas near the edge of TV station reception, and in areas of complex topography. Impacts to low power stations and translator stations are not anticipated to occur because those stations have a limited range. Full power TV stations have the potential to experience impacts if the wind farm is located in the line-of-site of the TV tower. Two full power TV towers (call signs KDLT-TV and KSMN) could possibly experience reception degradation if the Project is in the line-of-sight between the towers and their receptors.

Other Local Services

Lake Benton Wind II has employed a minimum setback of 534 feet (163 meters) from railroad ROW. The Applicant will coordinate with the Burlington Northern Santa Fe Railroad regarding the installation of Project collector line underneath the railroad. The Applicant will obtain approval from the railroad and the crossing of the railroad will be in compliance with standards as required by Burlington Northern Santa Fe.

Efforts are underway to identify the exact location of the existing Magellan 8" pipeline located in the Project Area. Turbines will be setback from the pipeline a minimum of 1.1 times the turbine tip height. The Applicant will coordinate with the Magellan Pipeline Company regarding the installation of project facilities in the vicinity of the pipeline and will obtain agreement or approval from the pipeline company as appropriate.

No impacts are expected to other existing local services or infrastructure, as the Project will avoid all such infrastructure. Should unknown infrastructure be identified during Project development or construction activities, the Applicant will coordinate with infrastructure owners as appropriate to minimize impact to end-users.

Septic services will be managed via portable toilets throughout project construction. All waste materials will be removed and disposed of appropriately off-site. The O&M building will require the construction of a permanent dedicated septic system. This will be constructed in accordance with local regulations and internal best practices.

Water used throughout the construction phase will be responsibly sourced per local regulation and internal best practices. The O&M building as currently proposed will incorporate a permanent well as a water source, which is to be constructed in accordance with local regulations and internal best practices.

8.5.6 Mitigation Measures**Traffic and Roads**

Turbines have been sited based upon national, state, and local guidelines and standards and will have a setback of no less than 250 feet (76 meters) from the edge of the public road ROW. Lake Benton Wind II has also located turbines to minimize traffic congestion along major highways that border the Project. Prior to construction, Lake Benton Wind II will coordinate with applicable local and state road agencies to ensure all applicable permits are obtained, delivery plans are communicated, traffic management plans are implemented where necessary, and weight limits are not exceeded. Lake Benton Wind II will formalize road development agreements with applicable roadway authorities to ensure that impacted or damaged roadways will be restored to their original condition or better. Lake Benton Wind II will require, through

its contract provisions, that the general contractor be in contact with the relevant road authorities during construction. Temporary impacts to the landscape associated with temporary access road approaches, the crane walk, and other temporary activities will be restored to previous conditions (*i.e.*, converted back to cropland or otherwise reseeded with native seed mixes appropriate for the region).

Telephone

At this time, impacts to telephone service are not anticipated. If inadvertent impacts to the system are identified during or after construction, Lake Benton Wind II will address these impacts on a case-by-case basis.

Microwave Beam Paths

Lake Benton Wind II has taken microwave beam paths into consideration during turbine siting and has worked to avoid impacts to these systems. Lake Benton Wind II will operate the Project in accordance with FCC regulation and other laws to avoid impacts to microwave, radio, or navigation systems.

AM/FM Radio

AM/FM radio stations are located far enough away from the Project Area that typical impacts are not expected. Lake Benton Wind II will address any reception impacts which may arise following construction of the Project on a case-by-case basis. Lake Benton Wind II does not propose specific mitigation measures at this time.

Fixed Land Mobile Stations

In the unlikely event that land mobile licenses experience impacts to coverage due to the Project, Lake Benton Wind II will address these issues on a case-by-case basis. Lake Benton Wind II does not propose specific mitigation measures at this time.

Television

The **Appendix E** study conducted an electromagnetic interference analysis for the Project and concluded that TV interference is expected to be limited to areas near a turbine that are within the line-of-sight between a transmitting tower and a TV receptor. In the unlikely event that TV interference is reported following Project construction, Lake Benton Wind II will work with affected residents or businesses to determine the cause of interference and, when necessary, reestablish TV reception and service in a timely manner. Reported TV interference will be addressed by Lake Benton Wind II on a case-by-case basis, and if reported Lake Benton Wind II will:

- Log the report and determine if the interference is Project related;

- Meet with the landowner and the local communications technician to determine the status of the affected television reception equipment;
- Discuss with the landowner the option of (1) installing a combination of high gain antenna and/or a low noise amplifier or (2) entering into an agreement to provide a monetary contribution (equal to the cost of installing the recommended equipment) toward comparable DBS service;
- At the landowner's election, Lake Benton Wind II will either install the recommended equipment or enter into an agreement to reimburse the landowner for the cost of comparable DBS service;
- If the landowner chooses DBS service, Lake Benton Wind II will consider the matter closed upon installation of the satellite dish;
- If the landowner elects antenna and/or amplifier installation and later reports continued interference issues, Lake Benton Wind II will send a technician to the property to assess the status of the equipment and provide any necessary repairs;
- If Project related interference remains an issue, Lake Benton Wind II will propose an agreement that reimburses the landowner for the cost of comparable DBS service and will remove the antenna and/or amplifier equipment, unless it was initially installed to service multiple households; and
- If Lake Benton Wind II and the landowner are unable to reach an agreement to resolve interference-related issues, Lake Benton Wind II will report the concern as an unresolved complaint and defer to the Commission's dispute resolution process to resolve the matter.

Other Local Services

In the unlikely event that impacts to other local services occur due to the Project, Lake Benton Wind II will address these issues on a case-by-case basis. Lake Benton Wind II does not propose specific mitigation measures at this time.

8.6 Cultural and Archaeological Resources

8.6.1 Sites Potentially Affected

The majority of the Project Area is located in the Southwest Riverine Archaeological Region, with a small portion of the northeast corner occurring within the Prairie Lakes Archaeological Region. The Southwest Riverine Archaeological Region covers the southwestern-most corner of Minnesota, including most of Pipestone County. The Prairie Lakes Archaeological Region covers most of southwestern and south central Minnesota and includes a small portion of northeast Pipestone County (Hudak et al. 2002). Archaeological resources are predominantly concentrated along the Rock River and its associated drainages in this area; specifically resources would be expected near water sources on terraces, bluffs, and hilltops. However, archaeological resources have been documented in all kinds of landforms within the region.

In June 2017, the Applicant met with The State Historic Preservation Office (SHPO) and Minnesota Office of the State Archaeologist (OSA) to gather cultural resources records related to the Project Area. A Phase Ia Cultural Resources Literature Review (Literature Review) was conducted for the Project Area as well as a one mile buffer surrounding the Project Area. The report is included in **Appendix F - Phase Ia Cultural Literature Review**. The Literature Review identified two architectural inventory resources documented within one mile of the Project Area.

The two architectural inventory resources are the GN Depot (PP-RTC-001) and the Ruthton Co-op Creamery (PP-RTC-003), both of which are located in the City of Ruthton, Minnesota. Very little information is contained within the records for these architectural resources. Review of current aerial imagery indicates the GN Depot and the Ruthton Co-op Creamery are no longer extant, and, therefore, are considered not eligible for National Register of Historic Places (NRHP). There are no historic properties listed on the NRHP, Minnesota State Historic Sites Network, and the Minnesota State Register of Historic Places located within the Project Area or within one mile of the Project Area.

A literature review also identified 19 previously inventoried archeological sites within the Project Area and two archaeological sites within one mile of the Project Area, which are set forth in Table 8.6.1. Of the 19 sites located within the Project Area, seven are prehistoric isolated finds, five are prehistoric artifact scatters, four are prehistoric lithic scatter, one is a prehistoric habitation site, one is a historic artifact scatter, and one is an artifact scatter and a historic structural ruin with both prehistoric and historic cultural components. Archaeological site 21PP0031 has been recommended as ineligible for the NRHP. The remaining 18 archaeological sites have not been formally evaluated for the NRHP. The two archaeological sites located within one mile of the Project Area have been recommended as ineligible for listing on the NRHP.

Table 8.6.1: Previously Reported Archaeological Sites within One Mile of the Project Area

County	State Site Number	Site Name	Site Type	Cultural Affiliation	NRHP Eligibility Recommendation	Project Area/Within One Mile
Murray	21MU112	Unnamed	Artifact Scatter	Pre Contact	Recommended Not Eligible	Within One Mile
Murray	21MU114	Unnamed	Artifact Scatter; Lithic Scatter	Pre Contact	Recommended Not Eligible	Within One Mile
Pipestone	21PP0022	Hauselog Site	Artifact Scatter	Prehistoric	Unevaluated	Project Area
Pipestone	21PP0025	The Disappointing Site	Artifact Scatter	Prehistoric	Unevaluated	Project Area

County	State Site Number	Site Name	Site Type	Cultural Affiliation	NRHP Eligibility Recommendation	Project Area/Within One Mile
Pipestone	21PP0026	The Kallemeyr Site	Artifact Scatter	Prehistoric	Unevaluated	Project Area
Pipestone	21PP0029	The LaBrune Site	Boulder Teepee Ring and Boulder semi-circles	Archaic	Unevaluated	Project Area
Pipestone	21PP0031	Unnamed3	Artifact Scatter	Prehistoric	Recommended Not Eligible	Project Area
Pipestone	21PP0032	Klaus Site	Artifact Scatter	Historic	Unevaluated	Project Area
Pipestone	21PP0033	Francis Jr. Site	Single Artifact	Pre Contact	Unevaluated	Project Area
Pipestone	21PP0034	Bouman Site	Pre-Contact Artifact Scatter; Historic Structural Ruin	Pre Contact; Historic	Unevaluated	Project Area
Pipestone	21PP0035	LaVon Henry Site	Lithic Scatter	Indeterminate Prehistoric	Unevaluated	Project Area
Pipestone	21PP0036	Gangstad	Single Artifact	Pre Contact	Unevaluated	Project Area
Pipestone	21PP0037	Gopher Trap Site	Single Artifact	Pre Contact	Unevaluated	Project Area
Pipestone	21PP0038	Vander-Sluis Site	Lithic Scatter	Pre Contact/ Plains Village	Unevaluated	Project Area
Pipestone	21PP0039	Houselog Site	Single Artifact	Pre Contact	Unevaluated	Project Area
Pipestone	21PP0040	Brands Site	Single Artifact	Pre Contact	Unevaluated	Project Area
Pipestone	21PP0041	Venniewenhuyzen	Single Artifact	Pre Contact	Unevaluated	Project Area
Pipestone	21PP0042	Snack Site	Artifact Scatter	Pre Contact	Unevaluated	Project Area
Pipestone	21PP0043	Reese Site	Lithic Scatter	Indeterminate Prehistoric	Unevaluated	Project Area
Pipestone	21PP0044	Alderson	Single Artifact	Pre Contact	Unevaluated	Project Area
Pipestone	21PP0045	Barke	Lithic Scatter	Pre Contact	Unevaluated	Project Area

As of the date of this filing, archaeological surveys have been initiated within the Project Area, and additional archaeological survey is planned concurrent with final siting of Project facilities. Prior to initiating archaeological surveys, Lake Benton Wind II conducted micrositeing to identify suitable locations for facility components. Lake Benton Wind II invited several Tribes in the area to participate in micrositeing and subsequent archaeological surveys; the following tribes chose to participate: Yankton Sioux Tribe, Upper Sioux Community, and Rosebud Sioux Tribe.

During micrositeing, the locations of six previously recorded archeological sites were reviewed in the field. These previously recorded archeological sites are listed in Table 8.6.1a below and descriptions of the field evaluations are provided. These sites were not able to be relocated in the field, with the exception of the structural ruins located at 21PP0034, and are listed as unevaluated for the NRHP.

Table 8.6.1a: Previously Recorded Archaeological Sites Reviewed During Micrositeing

State Site Number	Site Name	Site Type	Cultural Affiliation	NRHP Eligibility Recommendation	Current Site Condition	Existing Infrastructure
21PP0032	Klaus Site	Artifact Scatter	Historic	Unevaluated	No site remains noted	Existing access road
21PP0033	Francis Jr. Site	Single Artifact	Pre Contact	Unevaluated	No site remains noted	Existing access road and existing turbine pad
21PP0034	Bouman Site	Pre-Contact Artifact Scatter; Historic Structural Ruin	Pre Contact; Historic	Unevaluated	Concrete rubble and structural ruins noted	Existing access road
21PP0038	Vander-Sluis Site	Lithic Scatter	Pre Contact/Plains Village	Unevaluated	No site remains noted	Existing access road and existing turbine pad
21PP0041	Venniewenhuyzen	Single Artifact	Pre Contact	Unevaluated	No site remains noted	Existing access road

21PP0045	Barke	Lithic Scatter	Pre Contact	Unevaluated	No site remains noted	Existing access road and existing turbine pad
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As a result of the archaeological surveys, one isolated archaeological occurrence was identified. Based upon the isolated nature and limited informational potential of the isolated occurrence, the archaeological site listed in Table 8.6.1b below does not appear eligible for listing on the NRHP.

Table 8.6.1b: Identified Archaeological Sites within Proposed Project Infrastructure

Field Site Number	Site Name	Site Type	Cultural Affiliation	NRHP Eligibility Recommendation	Proposed Infrastructure
IO-39	None	Single Artifact	Pre Contact	Not Eligible	Proposed turbine pad

A total of five Native American Sensitive sites were identified during field investigations. These five Native American Sensitive sites are listed in Table 8.6.1c below. These five Native American Sensitive sites were located within areas initially planned for Project infrastructure; however, project infrastructure has since been redesigned to avoid these five sites. However, two Native American Sensitive sites, LBII-43 and LBII-G104, are located within existing infrastructure. The Rosebud Sioux Tribe provided an area of no intrusion to protect LBII-43 during existing project decommissioning and Project construction. Lake Benton Wind II plans to avoid the no intrusion area and is continuing discussions with Tribes in the region. The five Native American Sensitive sites have not been formally evaluated by the Tribes or for listing on the NRHP.

Table 8.6.1c: Identified Native American Sensitive Sites within Project Area

Field Site Number	Site Name	Site Type	Cultural Affiliation	NRHP Eligibility Recommendation	Proposed/Existing Infrastructure
LBII-34	None	Rock Feature	Pre Contact	Unevaluated	None
LBII-41	None	Rock Feature and Raised Feature	Pre Contact	Unevaluated	None
LBII-43	RST 110317-1	Rock Alignment	Pre Contact/ Lakota/Dakota/Nakota	Unevaluated	Existing turbine pad

LBII-44	RST 110317-1	Traditional Cultural Plants	Pre Contact	Unevaluated	None
LBII-G061	None	Rock Feature	Pre Contact	Unevaluated	In vicinity of existing turbine pad
LBII-G104	None	Rock Feature	Pre Contact	Unevaluated	In vicinity of existing turbine pad
LBII-G117	None	Rock Alignment	Pre Contact	Unevaluated	In vicinity of existing turbine pad
LBII-G119	None	Rock Alignment	Pre Contact	Unevaluated	In vicinity of existing turbine pad
LBII-G120	None	Rock Alignment	Pre Contact	Unevaluated	In vicinity of existing turbine pad

8.6.2 Potential Cultural and Archaeological Impacts

While Lake Benton Wind II implements an avoidance strategy for cultural resources, the proposed construction activities for the Project may impact unidentified archaeological sites within the region of the Project. Should impacts to cultural resources that appear eligible for listing on NRHP be unavoidable, Lake Benton Wind II will consult with the Tribes, SHPO and/or OSA on whether or not the resource is eligible for listing in the NRHP. In addition, should Lake Benton Wind II impact unidentified archaeological sites during Project construction Lake Benton Wind II will follow an unanticipated discovery plan (UADP) to address any unanticipated discoveries of cultural resources, including archaeological sites and possible human remains. Further information concerning the UADP is discussed below. With these avoidance and mitigation measures in place, impacts on cultural and archeological resources are expected to be minimal.

Coordination with the SHPO was initiated for the Project by submitting a letter which included the Phase Ia Cultural Resources Literature Review (see **Appendix F - Phase Ia Cultural Literature Review**) on October 11, 2017. The SHPO replied with a letter dated November 14, 2017 (SHPO Number 2018-0219) stating their concurrence with the avoidance of known archaeological resources, if at all possible, and recommending that a Phase I archaeological survey be completed for areas of proposed ground disturbance within previously determined high and medium archaeology probability areas (see **Appendix B - Agency Correspondence and Responses**). As previously stated, archaeological surveys have been initiated for the Project.

The locations of six previously recorded archaeological sites were re-examined during micrositeing. These sites are located within existing infrastructure and are listed as unevaluated for listing on the NRHP. While existing infrastructure, such as access roads, will continue to be used for the proposed Project, additional ground disturbance is not planned to impact locations. One isolated archaeological occurrence was identified during archaeological survey efforts, IO-

39, which is located within proposed Project infrastructure. Atwell recommended IO-39 as not eligible for the NRHP and Lake Benton Wind II does not plan to avoid the site. As no NRHP listed or eligible sites have been identified, no impacts to NRHP resources are expected.

Five Native American Sensitive Sites were identified during micrositeing and archaeological survey efforts. The proposed Project infrastructure was re-sited to avoid impacts to these five locations and as such no impacts to tribally sensitive sites are expected. Lake Benton Wind II continues to coordinate with Tribes in the region.

8.6.3 Mitigation Measures

Lake Benton Wind II will attempt to avoid impacts to previously recorded archaeological resources that are considered significant and any discovered significant archaeological, architectural or Native American sensitive resources during all phases of the Project. Additional Phase I archaeological surveys will be conducted prior to Project construction, as applicable. If significant archaeological resources are identified during the Phase I archaeological surveys, the integrity and significance of the resource(s) will be assessed in terms of the potential for NRHP eligibility. If the identified resource(s) are determined to be significant and cannot be avoided by the Project, further investigation and/or mitigation of the resource may be needed and will be coordinated with the Tribes, SHPO and/or OSA. While avoidance of archaeological resources would be the preferred option, mitigation of impacts to NRHP-eligible archaeological resources may be necessary. The results of this additional investigation or mitigation will be described and documented on a case-by-case basis by compilation into a report, or reports, and shared with the Tribes, SHPO, and/or the OSA.

The Applicant will develop and implement a UADP to be followed if cultural resources or human remains are inadvertently discovered to ensure that the appropriate authorities (SHPO and/or OSA, as applicable) are involved quickly and in accordance with local and state regulations. Should human remains be inadvertently discovered the UADP will also address Minnesota's *Damages; Illegal Molestation of Human Remains; Burials; Cemeteries; Penalty; Authentication Statute* (MS 307.08), which protects known or suspected human burials and burial grounds regardless of land ownership status.

8.7 Recreational Resources

8.7.1 Description of Resources

Pipestone County provides a variety of recreational opportunities including hiking, fishing, hunting, camping, snowmobiling, and nature viewing. Information from the USFWS, MNDNR, and Pipestone County were reviewed to identify recreational resources in the vicinity of the Project Area. Several WMAs, an SNA, a State Aquatic Management Area (AMA), WPAs, Walk-In Access (WIA) Program parcels, county parks, and snowmobile trails and are located within and near the Project Area.

WMAs are owned by the State of Minnesota and were established to protect and manage lands and waters for wildlife production, public hunting, trapping, fishing or other recreational activities. Minnesota has approximately 1,500 WMAs, consisting of over 1.3 million acres of public land (MNDNR 2017a). There are four WMAs within the Project Area comprising approximately 379 acres. Additionally, there are 50 WMAs located within ten miles of the Project Area. These WMAs are included in Table 8.7.1, below.

Table 8.7.1: Wildlife Management Areas within Ten Miles of the Project Area

Distance from Project Area (mi)	WMA Name	General Location Relative to Project Area	WMA Area (Acres)
0.0	Gromer's Draw WMA	Within Project Area	87.4 (35.4 hectares)
0.0	Buffalo Ridge WMA	Within Project Area	41.1 (16.6 hectares)
0.0	Woodstock WMA: East Unit	Within Project Area	203.9 (82.5 hectares)
0.0	Woodstock WMA: West Unit	Within Project Area	46.3 (18.7 hectares)
0.0	Van Beek WMA	Abuts Project Area	22.8 (9.2 hectares)
0.8 (1.3 km)	Holland WMA	West of Project Area	39.3 (15.9 hectares)
0.8 (1.3 km)	Coteau Pit WMA	West of Project Area	80.7 (32.7 hectares)
1.1 (1.8 km)	Lange WMA	East of Project Area	62.9 (25.5 hectares)
2.0 (3.2 km)	Adolph Lofthus WMA	East of Project Area	106.0 (42.9 hectares)
2.3 (3.7 km)	Van Eck WMA	East of Project Area	76.7 (31.0 hectares)
2.4 (3.9 km)	Ruthton WMA: West Unit	East of Project Area	54.5 (22.1 hectares)
2.7 (4.4 km)	Ruthton WMA: Central Unit	East of Project Area	158.9 (64.3 hectares)
2.8 (4.5 km)	Klinker WMA	East of Project Area	531.5 (215.1 hectares)
3.0 (4.8 km)	Terrace WMA	Southwest of Project Area	445.4 (180.3 hectares)
3.2 (5.2 km)	Ruthton WMA: East Unit	East of Project Area	80.1 (32.4 hectares)

Distance from Project Area (mi)	WMA Name	General Location Relative to Project Area	WMA Area (Acres)
3.5 (5.6 km)	Degroot WMA: West Unit	East of Project Area	69.4 (28.1 hectares)
3.9 (6.3 km)	Degroot WMA: East Unit	East of Project Area	5.3 (2.2 hectares)
4.0 (6.4 km)	Tutt WMA	East of Project Area	102.7 (41.6 hectares)
4.0 (6.4 km)	Hole-In-Mountain WMA	Northwest of Project Area	637.9 (258.2 hectares)
4.1 (6.6 km)	Hope WMA	North of Project Area	213.8 (86.5 hectares)
4.2 (6.8 km)	Hjermstad WMA: Dather Slough Unit	East of Project Area	36.3 (14.7 hectares)
4.3 (6.9 km)	Altona WMA	West of Project Area	551.8 (223.3 hectares)
4.4 (7.1 km)	Tyler WMA	North of Project Area	400.9 (162.2 hectares)
4.7 (7.6 km)	Ellsborough WMA	East of Project Area	80.3 (32.5 hectares)
5.4 (8.7 km)	Discors WMA	North of Project Area	43.3 (17.5 hectares)
5.4 (8.7 km)	Hjermstad WMA: East Unit	East of Project Area	231.3 (93.6 hectares)
6.0 (9.7 km)	Winter WMA: East Unit	West of Project Area	12.9 (5.2 hectares)
6.0 (9.7 km)	Reinhold WMA	East of Project Area	21.4 (8.7 hectares)
6.0 (9.7 km)	Mccord-Laible WMA	East of Project Area	76.0 (30.8 hectares)
6.0 (9.7 km)	Shelburne WMA	East of Project Area	162.1 (65.6 hectares)
6.2 (10.0 km)	Nelson WMA: Streff Unit	East of Project Area	19.3 (7.8 hectares)
6.2 (10.0 km)	Nyroca Flats WMA	Northeast of Project Area	42.3 (17.1 hectares)
6.2 (10.0 km)	Nelson WMA: Main Unit	East of Project Area	181.3 (73.4 hectares)
6.2 (10.0 km)	Winter WMA: South Unit	West of Project Area	257.5 (104.2 hectares)
6.4 (10.3 km)	Troy WMA	West of Project Area	54.6 (22.1 hectares)

Distance from Project Area (mi)	WMA Name	General Location Relative to Project Area	WMA Area (Acres)
6.5 (10.5 km)	Current WMA: Island Unit	East of Project Area	4.1 (1.7 hectares)
6.7 (10.8 km)	Current WMA: Central Unit	East of Project Area	8.5 (3.4 hectares)
6.7(10.8 km)	Marshfield WMA	North of Project Area	74.7 (30.2 hectares)
6.8 (10.9 km)	Bergman WMA	East of Project Area	33.6 (13.6 hectares)
7.1 (11.4 km)	Winter WMA: West Unit	West of Project Area	310.6 (125.7 hectares)
7.2 (11.6 km)	Schindel WMA	Northwest of Project Area	156.2 (63.2 hectares)
7.3 (11.8 km)	Norgaard WMA	North of Project Area	21.1 (8.5 hectares)
7.4 (11.9 km)	Sioux Lookout WMA	Northwest of Project Area	83.1 (33.6 hectares)
7.7 (12.4 km)	Leeds WMA	Southeast of Project Area	153.8 (62.2 hectares)
7.7 (12.4 km)	Burke WMA	Southwest of Project Area	105.9 (42.9 hectares)
7.9 (12.7 km)	Chen Bay WMA	North of Project Area	257.2 (104.1 hectares)
7.9 (12.7 km)	Salt & Pepper WMA	South of Project Area	99.3 (40.2 hectares)
9.0 (14.5 km)	Great Oasis WMA	East of Project Area	123.5 (50.0 hectares)
9.1 (14.6 km)	Pipestone WMA	Southwest of Project Area	113.2 (45.81 hectares)
9.5 (15.3 km)	Chandler WMA: North Unit	Southeast of Project Area	38.6 (15.6 hectares)
9.5 (15.3 km)	Peters WMA	Southeast of Project Area	72.5 (29.3 hectares)
9.9 (15.9 km)	Dead Coon Marshes WMA	Northeast of Project Area	8.7 (3.5 hectares)
9.9 (15.9 km)	Collinson WMA	North of Project Area	19.3 (7.8 hectares)
9.9 (15.9 km)	Chandler WMA: South Unit	Southeast of Project Area	3.5 (1.4 hectares)

Minnesota's state SNAs are lands that are set aside for scientific study and to promote public understanding. They may consist of native plant and animal communities, rare species, and areas of significant biodiversity. The goals of the SNA program are to preserve Minnesota's natural heritage and to provide opportunities for nature-based recreation, education, and research (MNDNR 2017b). One SNA, Prairie Coteau SNA, is located within the Project Area and consists of approximately 420 acres (170 hectares). No other SNAs are located within ten miles of the Project Area.

State AMAs are management areas meant to protect, develop, and manage aquatic resources that are critical to the preservation of aquatic life for their water quality, intrinsic biological value, public fishing, and other outdoor recreational uses (MNDNR 2017c). State AMAs were not identified within the Project Area. However, one AMA, Lake Benton, is located approximately 5.3 miles (8.5 kilometers) from the Project Area. Additionally, other lakes, ponds, and rivers used for recreational purposes appear present within the Project Area and within ten miles (16 kilometers) of the Project Area.

WPAs are public lands managed by USFWS that are meant to preserve habitat for waterfowl and other wildlife. These areas are typically wetlands or grasslands that provide roosting and nesting habitat for waterfowl. Most of these federally-managed wetlands and surrounding uplands are open to hunting (USFWS 2015c). No WPAs are present within the Project Area. However, nine WPAs are located within ten miles (16 kilometers) of the Project Area and are displayed in Table 8.7.1a.

Table 8.7.1a: Waterfowl Production Areas within Ten Miles of the Project Area

Distance from Project Area (mi)	WPA Name	General Location Relative to Project Area	WPA Area (Acres)
5.9 (9.5 km)	Lyon County WPA	Northeast of Project Area	48.5 (19.6 hectares)
7.6 (12.2 km)	Lyon County WPA	Northeast of the Project Area	58.9 (23.8 hectares)
8.0 (12.9 km)	WPA	Northeast of the Project Area	235.7 (95.4 hectares)
8.1 (13.0 km)	Lyon County WPA	Northeast of the Project Area	11.0 (4.5 hectares)
8.2 (13.2 km)	Fox WPA	North of the Project Area	146.1 (59.1 hectares)

Distance from Project Area (mi)	WPA Name	General Location Relative to Project Area	WPA Area (Acres)
8.3 (13.4 km)	Lyon County WPA	Northeast of the Project Area	57.4 (23.2 hectares)
8.3 (13.4 km)	Lyon County WPA	Northeast of the Project Area	30.2 (12.2 hectares)
8.6 (13.8 km)	Weber WPA	North of the Project Area	160.1 (64.8 hectares)

The MNDNR WIA program provides the public an opportunity to hunt on private land that is already enrolled in an existing conservation program or that consists of high quality natural cover. Land owners, at their own discretion, may choose to enroll their property into the WIA program and allow residents of Minnesota to freely hunt on their property between September 1 and May 31. Typically, WIA agreements are active for one to three years (MNDNR 2017d). Review of GIS data identified four WIA parcels within the Project Area and an additional 14 WIA parcels within 10 miles (16 kilometers) of the Project Area. Table 8.7.1b, below, includes a list of the identified WIA parcels.

Table 8.7.1b: WIA Parcels within Ten Miles of the Project Area

Distance from Project Area (mi)	WIA Name	General Location Relative to Project Area	WPA Area (Acres)
0.00	Pipestone WIA #129	Within the Project Area	147.65 (59.75 hectares)
0.00	Pipestone WIA #225	Within the Project Area	80.68 (32.65 hectares)
0.00	Pipestone WIA #226	Within the Project Area	166.89 (67.54 hectares)
0.00	Pipestone WIA #358	Within the Project Area	48.30 (19.55 hectares)
0.02 (0.03 km)	Lincoln WIA #74	North of the Project Area	76.15 (30.82 hectares)

Distance from Project Area (mi)	WIA Name	General Location Relative to Project Area	WPA Area (Acres)
0.50 (0.80 km)	Murray WIA #144	East of the Project Area	104.99 (42.49 hectares)
1.50 (2.41 km)	Murray WIA #148	Southeast of the Project Area	62.78 (25.41 hectares)
2.52 (4.06 km)	Murray WIA #150	East of the Project Area	236.79 (95.83 hectares)
2.86 (4.60 km)	Lincoln WIA #348	Northeast of the Project Area	50.47 (20.43 hectares)
3.02 (4.86 km)	Murray WIA #141	Southeast of the Project Area	116.97 (47.34 hectares)
3.23 (5.20 km)	Pipestone WIA #179	Southwest of the Project Area	145.21 (58.76 hectares)
4.69 (7.55 km)	Lincoln WIA #217	North of the Project Area	10.80 (4.37 hectares)
5.12 (8.24 km)	Pipestone WIA #127	West of the Project Area	541.41 (219.10 hectares)
6.61 (10.64 km)	Lincoln WIA #219E	Northwest of the Project Area	95.13 (38.50 hectares)
6.82 (10.98 km)	Murray WIA #347	East of the Project Area	116.82 (47.28 hectares)
7.81 (12.57 km)	Lincoln WIA #219W	Northwest of the Project Area	64.38 (26.05 hectares)
8.06 (12.97 km)	Lincoln WIA #201	Northwest of the Project Area	161.54 (65.37 hectares)
8.98 (14.45 km)	Lincoln WIA #218	North of the Project Area	32.97 (13.34 hectares)

Parks and public trails are also types of publically-managed lands that provide outdoor recreational opportunities to the public. There are no federal, state, or city parks located within

the Project Area. However, three county parks are located within ten miles of the Project Area and are displayed in Table 8.7.1c. Additionally, one public trail, the Casey Jones Trail, occurs approximately 3.6 miles (5.8 kilometers) south of the Project Area, near Woodstock.

Table 8.7.1c: County Parks within Ten Miles of the Project Area

Distance from Project Area (mi)	County Park Name	General Location Relative to Project Area	County Park Area (Acres)
4.2 (6.8 km)	Twin Lakes County Park	Northeast of Project Area	27.5 (11.1 hectares)
6.3 (10.1 km)	Hole in the Mountain County Park	Northwest of Project Area	800 (324 hectares)
6.5 (10.5 km)	Norwegian Creek County Park	Northwest of Project Area	140 (57 hectares)

Snowmobiling is a popular recreational activity throughout Minnesota, with state designated trails traversing most of the state. Although the trails are state designated, most snowmobile trails are monitored and maintained by the local snowmobile clubs. The closest snowmobile trail to the Project, the “Hiawatha Sno” Blazers Trail, is located approximately 1.5 miles (2.4 kilometers) southwest of the Project Area, on the southwest side of Holland. Three additional snowmobile trails are located within 10 miles of the Project Area including the Lincoln County Drift Clipper Trails, Lyon County Trail, and Beaver Creek Trail.

8.7.2 Potential Impacts

Although several public and recreational lands are located within and adjacent to the Project Area, the Project has been designed in a way that will avoid direct impacts to recreational resources and public lands. No turbines have been sited within public lands or designated recreational resources, and turbines will be sited consistent with the 3 RD X 5 RD setback of WMAs, SNAs, AMAs, WPAs, and county parks. However, turbines located within the viewshed of recreational resources and lands managed by the MNDNR may affect the aesthetic quality of those areas. As many turbines already exist within the Project Area the Project will not introduce a new feature type within the viewshed of the Project Area.

As shown on **Map 6 (Public Land Ownership & Recreation)**, there are four WMAs, four WIAs, and one SNA within the Project Area, and additional 50 WMAs, one AMA, nine WPAs, three county parks, and 14 WIAs within ten miles (16 kilometers) of the Project Area. Additionally, there are four snowmobile trails within 10 miles of the Project Area, with the closest located approximately 1.5 miles (2.4 kilometers) southwest of the Project Area. No

direct impacts will occur to these resources due to responsible siting of turbines. Wind turbines may be visible from many of the public lands and snowmobile trails, but the exact degree of impact to the viewshed will vary based on type of observer and individual preference. Further information regarding potential visual impacts to public lands and recreational resources in relation to the Project Area is found in Section 8.4.

8.7.3 Mitigation Measures

No direct impacts to recreational resources are anticipated as a result of the Project as all turbines have been sited outside of recreational resources. Typical mitigation includes following, at minimum, the setback guidance for public lands of 3 RD X 5 RD. Additional mitigation measures related to potential visual impacts to public lands and recreational resources are detailed in section 8.4.3.

8.8 Public Health and Safety

8.8.1 Electromagnetic Fields and Stray Voltage

The term electromagnetic fields (EMF) refers to electric and magnetic fields that are coupled together, such as in high frequency radiating fields. For lower frequencies associated with power lines (referred to as extremely low frequencies or ELF), EMF should be separated into electric fields (EF), measured in kilovolts per meter (kV/m), and magnetic fields (MF), measured in milliGauss (mG). EFs are dependent on the voltage and MFs are dependent on the current. The intensity of an EF is proportional to the voltage of the line, and the intensity of an MF is proportional to the current flow through the conductors. Power lines in the United States operate at a power frequency of 60 Hz (cycles per second).

This section discusses electromagnetic fields associated with the Project.

8.8.1.1 Electric Fields

The 34.5 kV underground power cable used in the Project collector system is shielded, meaning the energized conductor is located at the center of the cable and is completely surrounded by a grounded metallic shield. This construction confines the electric field to the interior of the cable. Thus, there is no detectable EF produced by the cable or by any other components of the Project collection system.

8.8.1.2 Magnetic Fields

A MF is produced by the flow of current through a conductor or cable. The Project's collector system is a three phase system, which requires three separate cables to make up each circuit. The three cables that comprise a circuit are installed in close proximity to each other, with the entire assembly buried approximately 48 inches (122 centimeters) below grade. This method of installation causes the magnetic fields produced by each cable to be largely cancelled out by the

fields produced by the other cables, resulting in relatively low magnetic fields even at ground level directly above the cables.

The estimated MF calculations are assuming maximum current when all turbines are operating at 100% on the most heavily loaded cables. These maximum values represent the collection cables nearest to the substation, specifically, between the low side of Generator Step-Up transformer at collector substation and the first junction cabinet from the substation, with the cables laid flat but reasonably close together, so it represents the highest field that can reasonably be expected from the entire 34.5kV system. Table 8.8.1.2 shows maximum calculated MF values for the collection system home run cables. Home run cables are the largest cables carrying the most current within the collection system design. The values in Table 8.8.1.2 represent the maximum possible MF values, at a height of one (1) meter (3 feet) above the ground, under a maximum generation condition.

The MF profile data shows that MF levels decrease rapidly as the distance from the centerline increases (proportional to the inverse square of the distance from the source). The maximum calculated MF profiles around the collector lines considered for this project and for the life of the project are shown in Table 8.8.1.2.

Table 8.8.1.2: Estimated Magnetic Fields (mG)

Structure Type	System Condition	Current (Amps)	Distance to Proposed Centerline								
			-100' (-31 m)	-75' (-23 m)	-50' (-15 m)	-25' (8 m)	0'	25' (8 m)	50' (15 m)	75' (23 m)	100' (31 m)
Home run cable (34.5kV)	Normal	502	0.16	0.25	0.64	2.14	36.31	2.14	0.64	0.25	0.16

8.8.1.3 Stray Voltage

“Stray Voltage,” as defined by IEEE, is “A voltage resulting from the normal delivery and/or use of electricity (usually smaller than 10 volts) that may be present between two conductive surfaces that can be simultaneously contacted by members of the general public and/or animals. Stray voltage is caused by primary and/or secondary return current, and power system induced currents, as these currents flow through the impedance of the intended return pathway, its parallel conductive pathways, and conductive loops in close proximity to the power system. Stray voltage is not related to power system faults, and is generally not considered hazardous.”

“Stray voltage” generally refers to a voltage between the grounded neutral of a distribution system and the Earth. Most instances of stray voltage can be traced to unbalanced currents in distribution circuits, when the currents in the three phase conductors are not all equal. Lake

Benton Wind II's collector circuits are inherently balanced, so no appreciable neutral to Earth voltage is expected. Additionally, there will be no direct connection between Lake Benton Wind II's collection system and the local distribution system, and, therefore, no stray voltage from the electrical system is anticipated to impact the existing electrical system.

8.8.2 Potential Impacts

Extensive research has been conducted by the National Institute of Environmental Health regarding EMFs. To date, there is no conclusive research evidence that EMFs stemming from power lines pose significant impacts to health (Boorman GA et al. 1999). EMFs from underground electrical collection and feeder lines dissipates quickly and relatively close to the source due to the fact that they are buried underground, heavily insulated, and also shielded. Research has shown that electrical fields surrounding buried lines are negligible, and magnetic fields often dissipate significantly within approximately three feet (1 meter) of stronger EMF sources, such as transmission lines and transformers (CDC 2014).

Stray voltage is a natural phenomenon that is the result of low levels of electrical current flowing between two points that are not directly connected. Electrical systems, including farm systems and utility distribution systems, must be adequately grounded to ensure continuous safety and reliability and to minimize this current flow. Potential effects from stray voltage can result from a person or animal coming in contact with neutral-to-earth voltage. Stray voltage does not cause electrocution and is not related to ground current, EMF, or Earth currents.

8.8.3 Mitigation Measures

Based upon current research regarding EMFs, and the separation distances being maintained between transformers, turbines and collector lines from public access and occupied residences, EMF's associated with the Project are not expected to have an impact on public health and safety.

Electrical equipment will be grounded per ASNI and NESC guidelines to ensure safety and reliability. Correctly connecting and grounding electrical equipment will prevent potential issues related to "stray voltage." Stray voltage is typically not associated with underground electric collector lines, which connect to the Project substation and are not tapped or diverted for other uses. Therefore, stray voltage is not expected to have an impact on public health and safety.

8.8.4 Aviation

A review of the FAA National Airspace Systems Resources database revealed seven active registered airports and heliports located within 20 miles (32 kilometers) of the Project Area (Capitol Airspace Group 2017). Details about these airports are set forth in Table 8.8.4. The public airports nearest the project are Tyler Municipal Airport (6.54 miles (10.53 kilometers)

north of the Project Area Boundary) and Pipestone Municipal Airport (10.53 miles (16.95 kilometers) southwest of the Project Area Boundary).

Table 8.8.4: Airports within 20 Miles of the Project Area

Airport Name	City	County, State	Distance from the Project Area Boundary (Miles)	Runway Information	Runway Elevation (ft)
Tyler Municipal Airport (Public)	Tyler	Lincoln, MN	6.54	1 Turf	1,742
Pipestone Municipal Airport (Public)	Pipestone	Pipestone, MN	10.53	1 Asphalt/ 1 Turf	1,736/1,727 1724/1,736
Pipestone County Medical Center Heliport	Pipestone	Pipestone, MN	10.78	Roof-Top	1,723
Dykstra Acreage Airport (Private)	Trosky	Pipestone, MN	14.34	Turf	1,690
Slayton Municipal Airport (Public)	Slayton	Murray, MN	15.06	Asphalt	1,615/1,623
Mulder Field Inc. Airport (Private)	Ivanhoe	Lincoln, MN	17.85	Turf	1,669
Flandreau Medical Center Heliport	Flandreau	Moody, SD	19.58	Concrete	1,723

(AirNav 2017)

There are no registered public airports located within the Project Area. The closest registered airport is the Tyler Municipal Airport located approximately 6.54 miles (10.53 kilometers) away from the northern extent of the Project Area. This is a public-use airport with one 2,600 foot (793 meter) turf runway (Runway 14/32) with no published instrument approach procedures.

Due to the agricultural use within the region, small private runways may be associated with crop dusting activities within or near the Project Area.

Aviation Towers

The **Appendix E** study did not identify active aviation towers within the Project Area. Aviation towers provide radio communications related to air traffic. Four aviation towers are located within 25 kilometers (15.5 miles) of the Project Area. The aviation towers have the call signs KFP4, KNB7, KXI9, and WQDA480. Refer to Table 8.5.2 for a summary of FCC licensed signals within the Vicinity of the Project Area.

8.8.5 Potential Impacts

Under 14 CFR Part 77.9, all structures exceeding 200 feet (61 meters) above ground level (AGL) must be submitted to the FAA so that an aeronautical study can be conducted. The purpose for the study is to identify obstacle clearance surfaces that could limit the placement of wind turbines. The end result of the aeronautical study is the issuance of a determination of ‘hazard’ or ‘no hazard’. Additionally, a Tall Towers Permit and approval may be required by the MnDOT prior to developing the Project to ensure the safety of airspace within Minnesota. A permit from MnDOT is required for any of the following (MnDOT 2017a):

- Structure is greater than 500 feet (152 meters) AGL;
- Structure is more than 200 feet (61 meters) AGL within three nautical miles (6 kilometers) of an airport and increasing by 100 feet (31 meters) for each additional mile out to six miles or 500 feet (152 meters);
- Structure would increase an instrument approach minimum flight altitude or increase its flight visibility minimums;
- Structure would increase the minimum obstruction clearance altitude of a federal airway;
- or
- Structure penetrates any of the following imaginary surfaces: primary, horizontal, conical, approach, or transitional surfaces

To determine potential impacts to aviation associated with the development of the Project, Lake Benton Wind II contracted Capitol Airspace Group to conduct an Obstruction Evaluation for the Project Area for turbine heights up to 485 feet (148 meters). The summary of that report is detailed below.

At 485 feet (148 meters) AGL, the proposed turbines will not exceed 14 CFR Part 77.17(a)(1), 77.17(a)(2), or 77.19 imaginary surfaces.

Obstacle clearance surfaces overlying the Project Area are either constant 2,349 or 2,500 feet (716 or 762 meters) AMSL and are associated with Southwest Minnesota Regional Marshall/Ryan Field Airport (approximately 23 miles (approximately 37 kilometers) northeast of the

Project Area) instrument approach procedures and Sioux Falls Airport (approximately 45 miles (approximately 72 kilometers) southwest of the Project Area) TRACON minimum vectoring altitude sectors. The proposed wind turbines that exceed these surfaces would require an increase to instrument approach procedure minimum altitudes and/or minimum vectoring altitudes. USGS elevation data indicates that 485-foot (148 meter) AGL wind turbines would require an increase to Sioux Falls TRACON Sector F minimum vectoring altitude.

In addition, at 485 feet (148 meter) AGL, all proposed wind turbines would be in line of sight of the Tyler Department of Defense (DoD) and Department of the Air Force (USAF) Common Air Route Surveillance Radar (CARSR). Proposed wind turbines that create unwanted clutter resulting in false radar returns and a decrease in radar sensitivity could impact air traffic control operations. The FAA may conduct additional analysis to identify potential safety hazards and the associated risks to the National Airspace System. The additional analysis may add time to the FAA's review of proposed wind turbines and could ultimately result in the determinations of hazard.

Crop dusting activity usually occurs during daylight hours with good visibility, allowing pilots to have a clear line of site with obstacles. Therefore, impacts to crop dusting activities are expected to be minimal.

Aviation Towers

The **Appendix E** study determined that harmful interference is not expected to impact aviation towers. Additionally, Lake Benton Wind II received a No Harmful Interference Anticipated (NHIA) response from the FAA on 11/20/2017.

8.8.6 Mitigation Measures

A Determination of No Hazard will be obtained from FAA for each turbine and MET tower prior to turbine and MET tower construction. In order to avoid potential impacts to air traffic, the Applicant will mark and light turbines to comply with FAA requirements. In order to obtain Determinations of No Hazard, mitigation for potential impacts related to Sioux Falls TRACON Sector F minimum vectoring altitudes may include direct coordination with the FAA Obstacle Evaluation Group during Project review and may include performing an air traffic analysis to determine the volume of operations within this sector. If it is determined that there will be impacts to Sioux Falls TRACON Sector F, Lake Benton Wind II will work with the FAA to implement an appropriate mitigation strategy to reach a Determination of No Hazard. Additionally, mitigation for potential impacts to CARSR may include direct coordination with the DoD and USAF and may include a Radar Effects and Mitigation Study. If it is determined that wind turbines will impact the CARSR system, Lake Benton Wind II will work with the DoD and USAF to implement appropriate mitigation strategies to reach a Determination of No Hazard.

8.8.7 Safety and Security

The Project is located in a predominately rural area of Pipestone County. Emergency management response services within the Project Area are provided by the Pipestone County Sheriff, Pipestone County Ambulance, Tyler Ambulance, Holland Fire Department, Ruthton Volunteer Fire Department, and the Lake Wilson Fire Department. Pipestone County has a specific plan for preparedness, response, recovery, and mitigation, and works closely with local, state, and federal officials to educate, prepare for, respond to, and recover from disasters and large-scale emergencies.

8.8.8 Potential Impacts

Potential safety and security impacts associated with the construction of the Project include human emergencies and accidents, natural hazards, hazardous materials incidents, and traffic accidents. Potential safety and security impacts associated with the operation of the Project, though rare, include danger of falling ice, unauthorized access to electrical and mechanical components of turbines, and turbine malfunction and/or collapse. The Project complies with all required setbacks, and each turbine will be regularly inspected and maintained in good repair and condition. In addition to proactive maintenance, modern turbine technology has reduced these potential operational risks to insignificant rates.

The overall population density within the Project Area is relatively low. With low overall population density, impacts from construction and maintenance are not expected on the safety and security of the local populations. In the event that local residents need emergency services during Project construction, construction will cease and any impeding construction equipment and vehicles will be relocated so that emergency vehicles and services may access the emergency location. During operation, the Project will not interfere with emergency services.

8.8.9 Mitigation Measures

Lake Benton Wind II will integrate current engineering standards with applicable regulatory requirements throughout the project design. As the project enters construction, adaptive management strategies for safety and security impacts identified in Section 8.8.8 will be incorporated as on-going improvements within the project. The Applicant will actively work with the Pipestone County and other agencies, as appropriate, to prepare an emergency management plan for the Project to respond to emergencies, natural hazards, hazardous materials incidents, human-made problems (*e.g.*, fire, etc.), and related incidents. Additionally, Lake Benton Wind II will work closely with the Pipestone County to ensure adequate assignment of 911 addresses for coordination of emergency responses.

Lake Benton Wind II will develop a site O&M manual as well as a health and safety training plan for the Project, which will include contacts, education and training materials, actions plans and procedures to reduce the potential for safety and security issues. In addition, during

construction of the Project, access to sensitive site areas such as the POI stations will be restricted access control measures, including the use of keyed locks and fencing, to protect against unauthorized access to the Project's facilities and subsequent exposure to potential hazards. Additionally, contracted security services will be employed through construction to ensure the security of construction equipment and facilities. The site team will work with landowners individually to ensure any specific security concerns they may have are being addressed to their satisfaction.

Safety and security measures will be implemented by Lake Benton Wind II for the protection of personal property and of personal injury. These measures include:

- Wind turbine locations will be registered with Pipestone County for emergency responses and procedures related to the Project;
- Project turbines and towers will comply with the setback standards established by the Commission;
- Proper health and safety training of construction and maintenance contractors will occur;
- Lake Benton Wind II will partner with contractors who demonstrate a strong safety culture including management commitment & engagement, safe work policies and programs, employee involvement, and historic safe work performance indicators. Contractors shall implement safe work requirements that meet or exceed OSHA requirements, applicable permits, applicable equipment manufacture and technical work instructions and any other prudent safety practices, methods, and/or standards prudently and generally engaged in or observed by the majority of construction contractors for similar work in the United States that, in the exercise of reasonable judgement, would have been expected to be implemented in a manner consistent with applicable laws, rules and regulations, as well as applicable permits while in sites to achieve an accident and injury-free work place.

8.9 Hazardous Materials

8.9.1 Description of Resources

The predominant land use in the Project Area is agriculture. Potentially hazardous materials associated with the Project Area would likely include petroleum products (diesel fuel, gasoline, propane, heating oil, lubricants, and maintenance chemicals), pesticides, and herbicides used in prior or ongoing agriculture related activities. Contaminants associated with asbestos and/or lead based paint may be present due to the age of many of farmsteads within the Project Area and

polychlorinated biphenyls may also be present associated with pad-mounted and pole-mounted transformers. In addition, in rural areas, trash or junk piles are a common occurrence.

The MPCA “What’s In My Neighborhood?” database (MPCA 2016a) of known and potential sources of soil and ground water contamination was reviewed for the Project Area. The MPCA database indicated that a total of 56 sites are listed within the Project Area, 47 of which are listed as active. Of these sites, there are 47 feedlots; three construction stormwater sites; one air site; one above ground tank site; one underground tank site; two unpermitted solid waste sites; and one multiple program site enrolled in the aboveground tank, hazardous waste, and petroleum remediation programs (MPCA 2016a).

During the construction of the Project, hazardous materials will be temporarily stored and utilized within the Project Area. These hazardous materials may consist of fuel, lubricating oil, hydraulic oil, propylene glycol, and other materials required for the construction of a wind farm. Additionally, during operation of the wind farm, hazardous materials, such as hydraulic oil, lube oil, grease, and cleaning solvents are necessary to maintain wind turbines and other equipment. Also, pad mounted and grounding transformers required for the operation of the Project contain large quantities of cooling fluids, likely consisting of mineral oil.

8.9.2 Potential Impacts

Prior to construction, the Applicant will conduct an ASTM-conforming Phase I Environmental Site Assessment to identify and avoid existing recognized environmental conditions (RECs) within the Project Area, particularly associated with facilities identified by the MPCA database.

Due to the presence of hazardous materials during construction and operation of the Project, there is the potential for spills and/or leaks. The primary concerns associated with these spills and/or leaks are the potential impacts to surface and ground water resources and the potential for soil contamination within the Project Area. To avoid potential impacts to water and soil resources, hazardous waste stored outdoors will be stored within secondary containment. Secondary containment will ensure that leaks, if they occur, will be contained and unable to impact important natural resources. Additionally, a Spill Prevention, Control, and Countermeasure Plan (SPCC) will be created for both the construction and operational phases of the Project. The SPCC will detail the appropriate storage, cleanup, and disposal of hazardous wastes to ensure potential impacts are avoided.

8.9.3 Mitigation Measures

Information from the Phase I Environmental Site Assessment will be used to identify and avoid, if necessary, any identified RECs. If RECs cannot be avoided, appropriate remediation, if required, will be conducted to avoid potential concerns associated with RECs. Any wastes generated during any phase of the Project will be handled and disposed of in accordance with Minnesota Rule Chapter 7045, local rules and regulations, and the site specific SPCC. Any

monitoring, transportation, or handling of materials will be conducted by trained and qualified personnel utilizing established procedures and proper equipment.

8.10 Land-Based Economies

8.10.1 Description of Resources

Land use within the Project Area is primarily agricultural, accounting for approximately 16,057 acres (6,498 hectares), or approximately 62.7 percent of the Project Area, as shown on **Map 18 (Land Cover)**. An additional 30.8 percent consists of hay/pasture/herbaceous land cover, much of which is used for livestock grazing (Homer et al. 2015). According to the 2012 USDA Agricultural Census Report, over 80 percent of the land in Pipestone County (roughly 241,970 acres (97,922 hectares)) was used for agriculture on approximately 637 farms. Corn, soybeans, and forage crops are the primary crops grown in Pipestone County, while swine and cattle are the predominant livestock raised in the county. Market value of agricultural products sold in the County for 2012 was approximately \$307.9 million, with crop markets at approximately \$117.3 million and livestock markets at approximately \$190.6 million (USDA 2014).

Approximately 54.8 percent of the Project Area is classified as prime farmland, while 16 percent is classified as prime farmland, if drained. Additionally, 12.9 percent of land within the Project Area is not prime farmland and 13.4 percent is considered farmland of statewide importance (NRCS 2017).

The use of feedlots is a common practice in raising livestock in the state of Minnesota. The MPCA administers rules regulating livestock feedlots in Minnesota. According to MPCA's "What's In My Neighborhood" map search tool, there are 665 registered feedlots in Pipestone County, 47 of which are in the Project Area (MPCA 2016a).

8.10.2 Potential Impacts

The Project is not expected to significantly impact agricultural land use or the general character of the area. While an average 0.56 acres (0.23 hectares) of land per turbine will be taken out of agricultural production for the life of the Project to accommodate the turbine pad, access roads, and ancillary facilities, the landowners may continue to plant crops near, and graze livestock up to the gravel roadway around each turbine pad. The placement of turbines in agricultural fields is suggested in the USFWS Land Based Wind Energy Guidelines (USFWS 2012). The primary impact to active agricultural land will be the reduction of crop production on a total of approximately 25 acres (10 hectares) of farmland in the Project Area. During construction, agricultural practices may be interrupted in areas that are typically farmed and construction activities may result in the temporary reduction in access to those areas and damage to drain tiles. This economic impact is offset by Lake Benton Wind II through lease payments agreed to by the landowner. Large-scale environmental impacts to agriculture or agricultural lands are not

anticipated with the placement of turbines, access roads, and ancillary facilities in agricultural fields.

Table 8.10.2 summarizes the impacts to prime farmland for the turbines, access roads, and O&M facility under consideration.

Table 8.10.2: Summary of Prime Farmland Impacts

Prime Farmland Type	Turbines (acres/hectares)	Access Roads (acres/hectares)	O&M Facility (acres/hectares)	Total (acres/hectares)
All Areas Prime Farmland	3.69/1.49	16.42/6.65	3.08/1.25	23.19/9.38
Prime Farmland if Drained	0.33/0.14	2.08/0.84	1.93/0.78	4.34/1.76
Farmland of Statewide Importance	1.00/0.41	6.10/2.47	0	7.10/2.88
Prime Farmland if protected from flooding or not frequently flooded during growing season	0	0.03/0.01	0	0.03/0.01
Not Prime Farmland	0.03/0.01	0.51/0.20	0	0.53/0.22
TOTAL	5.05/2.04	25.14/10.17	5.01/2.03	35.2/14.25

Livestock in pastureland may be temporarily disrupted during construction due to temporary activity and associated sound, but appropriate measures will be made to ensure fenced pastureland is secure. Temporary fencing may be put in place if fencing is impacted and will be repaired or replaced after construction.

Land that is used for agricultural production will largely remain unchanged. Crops will be able to be planted up to the gravel roadway around each turbine pad and up to the access roads. Changes

in agricultural equipment maneuvering routes around turbine structures will be required, but should have a nominal effect on overall production and are negotiated with each potentially affected landowner. Temporary impacts to farmland will include access road approaches, crane walks, turning radii, equipment laydown areas, and/or intersection improvements. When construction occurs outside of winter months, there is a higher possibility for temporary minor impacts including soil compaction, loss of planting opportunity, crop damage, and drain tile damage. The only farmland that will remain permanently altered will be land where permanent access roads, turbine pads, and supporting above-ground infrastructure are erected. Landowners will be compensated through lease payments for land taken out of agricultural production (approximately 0.56 acres (0.23 hectares) of land per turbine); lands adjacent to Project infrastructure can remain to be used for agricultural production and/or cattle grazing.

8.10.3 Mitigation Measures

Only the land for the turbines, certain electrical equipment, and access roads will be taken out of crop production. After construction is completed, all remaining land surrounding the turbines and access roads may still be farmed. The permanent loss of approximately 25 acres (10 hectares) of agricultural land will not result in the loss of agricultural-related jobs or net loss of income. Additionally, any revenue lost from the removal of land from agricultural production will be offset by lease payments to landowners according to their respective contracts with Lake Benton Wind II.

The Applicant will coordinate with landowners to identify property features, such as drain tiles, that need to be avoided during construction activities and will avoid these features where practicable. Where identified features, such as drain tiles cannot be avoided, the drain tile or other features will be repaired following construction and landowners will be compensated for crop damages or losses related to the damage. To the extent possible, staging areas and associated infrastructure will be placed in areas where previous soil impacts have occurred to avoid impacting undisturbed farmland. Should incidental soil compaction occur as a result of temporary construction activities, including staging areas, laydown areas, and crane paths, appropriate measures will be taken to ensure farmland is restored in accordance with the lease agreement between the landowner and Lake Benton Wind II. Where soil compaction occurs, restoration measures will include ripping up the compacted areas with a grader and revegetating the areas as discussed in Section 10.5.

8.10.4 Forestry

There are no economically important forestry resources within the Project Area. According to 2011 Land Cover Data, approximately 0.2% of the Project Area consists of wooded areas (Homer et al. 2015). Most wooded areas within the Project Area consist of shelterbelts or small woodlands surrounding active farmsteads or streambanks. No impacts to economically important forestry resources are expected to occur; therefore, no mitigation will be necessary.

8.10.5 Mining

Quarries, gravel, and sand pits exist throughout Pipestone County, but are largely inactive, abandoned, or their use is limited to a private landowner. Based on review of MnDOT County Pit Maps and USGS topographic maps for the Project Area, six (6) active pits are scattered throughout the Project Area (MnDOT 2002, USGS 2014b). Refer to **Map 19 (Site Geology and Depth to Bedrock)**. Review of aerial imagery indicates that five of these pits are likely abandoned/ inactive and have been returned to agriculture. Also, five of the pits are listed as “prospected,” indicating that the pit has been prospected and/or leased by MnDOT. The “prospected” classification does not necessarily imply that the source is actually producing aggregate at the present time. Project infrastructure will not be located within sand or gravel operations.

8.10.6 Potential Impacts

Negative impacts to mining resources are not anticipated. Project infrastructure will not be located within mining resources; therefore, direct impacts to mining resources will not occur. Lake Benton Wind II may request to use aggregate from mining operations for use during construction. Lake Benton Wind II will coordinate with the local mining operations, as appropriate.

8.10.7 Mitigation Measures

Lake Benton Wind II will design the Project to avoid locating infrastructure within or near mining operations. As impacts to mining operations are not anticipated, mitigation is not proposed.

8.11 Tourism

Pipestone County offers tourism and recreational opportunities throughout the year. In 2015, annual leisure and hospitality expenditure in Pipestone County was approximately \$11.7 million, which equated to about 318 tourism-related jobs in the County (MnEED 2017). Generally, tourism in Pipestone County focuses on promoting the area’s cultural history as well as outdoor recreational activities. Pipestone County offers tourism draws such as the Pipestone National Monument, the Pipestone County Museum, historic district walking tours, and Split Rock Creek State Park, while local community events include Pipestone Ghost Walks, the Watertower Festival, and Pipestone Civil War Days.

As shown in Section 8.7, there are 54 WMAs, nine WPAs, one SNA, one AMA, 18 WIAs, three county parks, and four snowmobile trails are located within ten miles of the Project Area. Five WMAs, four WIAs, and one SNA occur within, or abut, the Project boundary. These public resources provide recreational and tourism opportunities including biking, camping, wildlife

watching, hunting, fishing and snowmobiling. Refer to **Map 6 (Public Land Ownership & Recreation)**.

8.11.1 Potential Impacts

The Project facilities are expected to be located mostly on private lands, and, therefore, relatively few, if any, direct impacts are anticipated on existing recreational facilities and tourism activities. Proposed setbacks from recreational facilities, public roads and non-leased properties will minimize any indirect impacts. Potential impacts will be mostly visual in nature, as the Project may alter the viewshed from public lands within and around the Project. However, turbine structures are already a feature type within the viewshed of the Project Area. Therefore, the Project is not anticipated to have a negative effect on area tourism.

8.11.2 Mitigation Measures

No direct impacts to tourism are anticipated as a result of the Project. Additional mitigation measures related to potential visual impacts to the viewshed from public and recreational lands are detailed in section 8.4.3.

8.12 Local Economies

According to the ACS 2011-2015 estimates, educational services, health care, and social assistance accounted for 24.7% of jobs statewide in Minnesota, followed by manufacturing at 13.5% and retail trade at 11.2% (U.S. Census Bureau 2015). The 2011-2015 ACS also estimates that educational services, health care, and social assistance accounted for 22.3% of jobs in Pipestone County, followed by retail trade at 12.8% and agriculture, forestry, fishing and hunting at 11.8% (U.S. Census Bureau 2015). Similarly, the Minnesota Employment and Economic Development Quarterly Census of Employment and Wages indicates the top industries in Quarter 2 of 2017 for Pipestone County are education and health services at 26.3% followed by trade, transportation, and utilities at 20.7% (MNDEED 2017b).

8.12.1 Potential Economic Impacts

Overall, the Project will positively impact the region by adding infrastructure, temporary and permanent jobs, increasing the counties' tax base, and providing lease payments to Project participants. The communities near the Project are also expected to receive positive economic benefits as construction will necessitate the need for numerous temporary and full time positions. Approximately 200 construction and 7 to 12 full time operations and maintenance jobs are expected as part of the Project. Lake Benton Wind II plans to use some local contractors and suppliers, where feasible, for portions of construction which will contribute to the overall economy of the region. Purchase of products to construct and operate the facilities such as fuel, equipment, services, and supplies will benefit businesses in the counties as well as in the state.

Minor short-term impacts to the socioeconomic resources of the area are anticipated. It is likely that some land will be removed from agricultural production or other land use for the length of the Project. However, this impact will be offset through annual payments over the life of the Project to those landowners having a turbine or other Project facility constructed on their land, which will also help strengthen the local economy. Lake Benton Wind II does not have the authority to exercise eminent domain for the Project. Land lease agreements and wind easement agreements are voluntary and will be agreeable by all involved parties to ensure the landowners are fairly compensated.

8.12.2 Tax Payments

Pipestone County is expected to experience short-term positive economic impacts associated with tax payments during the construction phase of the Project through the use of the hotels, restaurants, and other consumer goods and services by the various workers, as well as the purchase of materials such as fuel, concrete, and gravel from local vendors. It is anticipated that the economic impact would also expand into towns and cities within adjacent Lincoln, Lyon, and Murray counties.

Wind energy infrastructure in the Project Area will provide significant long-term positive economic benefits to local landowners, the state, and the local economy of southwestern Minnesota. Landowners in the Project Area will benefit from annual lease payments, while, in accordance with state and county law, Lake Benton Wind II will pay property tax and production taxes on the land and energy production to local governments. For example, the Project will pay a Wind Energy Production Tax to the local units of government of \$0.0012 per kWh of electricity produced. This would result in an annual Wind Energy Production Tax of \$500,000-\$600,000 for Pipestone County once the Project is repowered. In comparison to the existing project to be decommissioned, which had an average annual Wind Energy Production Tax of approximately \$335,000 between the years of 2006 and 2017, the proposed Project will result in a higher annual Wind Energy Production Tax to the local units of government.

8.12.3 Mitigation Measures

Adverse economic impacts as a result of the Project are not expected. Regional businesses and service providers are anticipated to experience a temporary increase in business during the construction of the proposed Project, while annual lease payments to landowners are expected to offset potential losses from agricultural production. Additionally, Pipestone County will experience an increase in tax revenues due to the Wind Energy Production Tax and property tax payments.

8.13 Topography

8.13.1 General Description

The general topography of the Project Area is described as undulating, rolling relief with approximate elevations between 1,790 and 1,960 feet (546 and 597 meters) above MSL. The Project Area generally has higher elevations in the central and northwestern sections with lower elevations in the northeast, southeast, and southwest. Local slopes vary throughout the Project Area but generally slope to the northeast, southeast, and southwest from the center of the Project Area (see **Map 13 - Topographic Map**).

According to the MNDNR Ecological Classification System, the Project Area is located partly within the Inner Coteau Subsection (251Bc) and the Coteau Moraines Subsection (251Bb) of the North Central Glaciated Plains Section of the Prairie Parkland Province. The Inner Coteau and Coteau Moraines Subsections are generally characterized by rolling topography, Late Wisconsin highly dissected moraines, with loess caps. The highest elevation within these subsections includes Buffalo Ridge, a ridgetop that traverses southeast Minnesota in a northwest to southeast orientation. The highest elevation of this ridge occurs within northern Pipestone County, and reaches approximately 1995 feet (608 meters) above MSL. Buffalo Ridge crosses through the center of the Project Area, creating the undulating landscape (MNDNR 2017c).

8.13.2 Potential Impacts

Some limited, localized impacts to the topography within the Project Area will come from the construction of turbine pad sites, access roads, and associated Project facilities. Anticipated impacts, however, will be minor in nature as construction of these features will not require significant excavation or fill for foundations or road bases.

8.13.3 Mitigation Measures

No significant impacts to topography are anticipated; therefore, no mitigation measures will be implemented. Lake Benton Wind II will implement construction Best Management Practices (BMP) in accordance with the MPCA's *Stormwater Best Management Practices Manual* and the approved Project Stormwater Pollution Prevention Plan (SWPPP) to ensure erosion and sedimentation are minimized. In addition, Lake Benton Wind II will also avoid construction activities in areas with steep slopes (>10 percent), where feasible, to minimize the risk of erosion and sedimentation.

8.14 Soils

8.14.1 General Description

Overall, the Project Area is largely comprised of four soil associations with similar characteristics. These include Lamoure-Estelline (s3546), Vienna-Kranzburg-Hidewood

(s3545), Langhei-Hamerly-Barnes (s3467), and Flom-Barnes (s3542) associations, and are generally composed of silt loam to silty clay loam soils that are moderately dark in color and occur on level to steep slopes (see **Map 20 - Soils**). These soil associations are generally deep, poorly drained to well drained, and are formed from loess and glacial till (NRCS 2017). Soil associations and their coverage of the Project Area are listed in Table 8.14.1 below.

Table 8.14.1: Soil Associations in Project Area

Soil Association	Area (Acres)
Lamoure-Estelline (s3546)	3,337.65 (1,350.70 hectares)
Vienna-Kranzburg-Hidewood (s3545)	3,626.89 (1,467.75 hectares)
Langhei-Hamerly-Barnes (s3467)	15,012.66 (6,075.41 hectares)
Flom-Barnes (s3542)	3,619.70 (1,464.84 hectares)

8.14.2 Potential Impacts

Construction and operation of the proposed Project will result in short and long-term impacts to soils within the Project Area. Short-term and minor impacts will result from the clearing of vegetation, generation of dust, and the excavation, stockpiling, and redistribution of soils. These activities are described further in Section 10. During construction, there is also the potential for localized soil erosion and sedimentation. Long-term impacts will include soil compaction. However, following Project completion, Project facilities will be decommissioned and soils will be returned back to agricultural use. The total percent and acres of soil that would be impacted can be determined following final design and siting. Refer to Section 8.10.2 for additional information related to impacts related to prime farmland.

8.14.3 Mitigation Measures

A National Pollutant Discharge Elimination System (NPDES) permit, a SWPPP, and BMPs will be developed and implemented prior to the commencement of construction. Sedimentation and erosion will be reduced through the use of BMPs including, but not limited to, mulching, hydroseeding, erosion control blankets, silt fence installation, jute matting, revegetation and/or interim reclamation. Water and chemical application will be used to suppress dust as discussed in Section 10. Following the completion of construction, all impacted property that will not continue to be used for operation of Project facilities will be restored to pre-construction

condition in accordance with landowner lease agreements as described further in Section 10.5. As part of the restoration efforts, compacted soils will be ripped up with a grader and revegetated. Soil will be used as backfill, will be spread out around the construction areas, graded in some locations to drain away from turbines, and topped with gravel or topsoil as appropriate. Areas where infrastructure is not located will be topped with topsoil and revegetated. In implementing these systems, plans and practices, measures will be taken to protect surface waters from direct and indirect impacts of sedimentation and erosion, while simultaneously preventing any adverse impacts to soil resources.

8.15 Geologic and Groundwater Resources

8.15.1 General Description

The majority of the bedrock that is located beneath the Project Area and surrounding vicinity is made up of Sioux Quartzite with some scattered portions of the bedrock comprised of undifferentiated rock (see **Map 19 - Site Geology and Depth to Bedrock**). This Sioux Quartzite was formed during the early part of the Paleozoic Era approximately 1,600 million years ago. Wisconsin Glaciation glacial till and loess (wind-blown silt) overlies the Early Proterozoic rock and makes up the present day surface of the Project Area. The glacial till can be up to 100 feet (31 meters) thick and is largely comprised of sand, gravel, silt and clay (Pipestone County et al. 2015).

Groundwater resources are not abundant or widely distributed within this portion of the state because of lower precipitation rates and the quaternary and bedrock geology present in this region (Adolphson et al. 1982). The limited groundwater resources in this region have prompted the establishment of an extensive network of water pipelines which transport groundwater from a few select areas with productive groundwater wells to the majority of the region (Patterson 1997).

Groundwater in the region is supplied by a shallow water table or bedrock wells in sandstone and fractured Sioux Quartzite aquifers (Bradt 1997). Regional ground-water flow in these aquifers is variable and much of the water supplies come from surficial sand and gravel deposits.

According to the Minnesota Department of Health's County Well Index online database (MDH 2017), wells are interspersed throughout the Project Area. Well depths within the Project Area vary widely, with most being less than 100 feet deep (MDH 2017).

8.15.2 Potential Impacts

Footings designed to support turbines will in some cases require minor impacts to glacial drift. Geotechnical testing will occur at turbine locations prior to construction to determine soil stability and depth to hard rock.

Major impacts to groundwater resources and wells are not expected from Project related activities due to Lake Benton Wind II's abundance of water-related setbacks and the minimal water-related needs of the Project. A well will be installed to fulfill the O&M building water requirements. Water may be needed if a temporary batch plant is needed on-site to supply concrete for the construction of the Project. The temporary batch plant will be located at the laydown yard or O&M building. In the event that a batch plant is required, appropriate permitting will be obtained prior to construction. The water used for concrete production, dust abatement, etc. would either come from a local well or may be trucked in from a suitable local resource and stored at the concrete batch plant site. The source of water will be determined closer to construction. Construction dewatering may occur depending on the respective site, weather, and soil conditions. Dewatering consists of the removal of surface water and/or groundwater by diverting and/or removing construction areas within water features or wet areas, as needed for construction.

8.15.3 Mitigation Measures

Well locations will be taken into account and turbines will be set back following state and county standards. Construction and operation of the proposed project is not expected to impact groundwater resources, so no mitigation is proposed. While dewatering is not anticipated, should dewatering occur, mitigation measures to address dewatering are summarized in Section 8.16.5.

8.16 Surface Water and Floodplain Resources

8.16.1 Lake, Rivers, Streams, and Ditches

The Project Area is located within portions of the Missouri River Basin; Rock River watershed (HUC8 10170204) and the Upper Mississippi River Basin; Redwood River watershed (HUC8 07020006) (USEPA 2017a, b). Within these drainage basins, numerous intermittent and ephemeral watercourses and a few perennial watercourses are scattered across the Project Area.

According to the USGS NHD dataset, the Project Area contains approximately 99.7 acres (40.35 hectares) (0.39%) of NHD waters (USGS 2017) (see **Map 21 - Surface Water**). Three of the watercourses within the Project Area are MN Public Water Inventory (PWI) Public Watercourses with designated 50-foot (15 meter) buffer requirements according to the MN Buffer Law (MNDNR 2017d). This includes the Redwood River in the northeast portion of the Project Area, the Rock River in the central portion of the Project Area, and the East Branch Rock River in the southwest portion of the Project Area. Additionally, there are nine un-named watercourses that drain away from the Project Area along the eastern and western boundaries. Further, a number of PWI "public ditches" in the central portion of the Project Area have a 16.5 foot (5.0 meter) designated buffer requirement. Based on aerial photograph interpretation, a moderate number of the aforementioned watercourses would likely be considered jurisdictional Waters of the U.S. (WOUS) due to their proximity to the Red or Minnesota Rivers.

Public waters are identified on PWI maps that display waters of the state and are designated as public waters under MNDNR's Public Waters Permit Program (Revisor of Statutes, State of Minnesota 2016) (see **Map 21 - Surface Water**). The following table outlines public waters within the Project Area.

Table 8.16.1: Public Waters Inventory

PWI Type	PWI Feature Name	PWI Unique Feature ID	Length within Project Area (miles)
PW Natural	Redwood River	59047a	1.92 (3.09 kilometers)
PW Natural	Rock River	59011a	2.49 (4.01 kilometers)
PW Natural	Rock River, East Branch	51052a	2.06 (3.32 kilometers)
PW Natural	Unnamed Stream	N/A	0.84 (1.35 kilometers)
PW Natural	Unnamed Stream	59001a	1.54 (2.48 kilometers)
PW Natural	Unnamed Stream	59053a	1.10 (1.77 kilometers)
PW Natural	Unnamed Stream	42001a	0.98 (1.58 kilometers)
PW Natural	Unnamed Stream	41053a	0.35 (0.56 kilometers)
PW Natural	Unnamed Stream	59048a	0.002 (0.003 kilometers)
PW Natural	Unnamed Stream	59061a	1.85 (2.98 kilometers)
PW Natural	Unnamed Stream	51016a	0.50 (0.80 kilometers)
PW Natural	Unnamed Stream	59058a	0.93 (1.50 kilometers)
Total:			14.57 (23.45 kilometers)

Section 303(d) of the Clean Water Act requires each state to list streams and lakes that are not meeting their designated uses because of excess pollutants every two years. Three recorded waterbodies within the Project Area are listed as impaired by the MPCA (2016b). The Redwood River, Rock River, and East Branch Rock River fail to meet one or more of the following water quality standards including turbidity, E. coli, and/or failing to meet one or more bioassessment standards for macroinvertebrates.

8.16.2 Designated Wildlife Lakes and Special Waters

The MNDNR commissioner may formally designate lakes for wildlife management under the authority of Minn. Stat. § 97A.101 subdivision 2 (a) after notice and a hearing. There are no MNDNR designated wildlife lakes within the Project Area. There are also no identified outstanding resource value waters or trout streams within the Project Area (MNDNR 2015).

8.16.3 FEMA Floodplains

Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) have been created and are available for most of the Project Area, but the majority of base flood elevations have not been determined. There are no 100-year flood plains (Zone A) located within the Project Area (FEMA 2017). A large expanse of the Project Area that has “public ditches” has been determined to be an area with minimal flood hazards (Zone C). A floodplain map is provided as **Map 22 (FEMA Flood Zone Map)**. FEMA Floodplain Panels are included in **Appendix G (FEMA Floodplain Panels)**.

8.16.4 Potential Impacts

Overall, surface waters will remain largely unimpacted because the Project will be designed to avoid or minimize adverse impacts to surface waters. Permanent dewatering will not occur, though the possibility exists that temporary dewatering of turbine foundations and collection lines will occur as needed. Temporary or permanent impacts to surface water runoff may be associated with crane paths, access roads, turbine pads, subsurface electrical collector lines, the substation, and the O&M facility.

There is potential for erosion and sedimentation to occur associated with ground-disturbing activities. Moderately to strongly sloped ground can also be subject to sheet and rill erosion or slumping.

8.16.5 Mitigation Measures

Reclaimed topographic conditions will be similar to pre-disturbance conditions. The reclaimed landscape will blend with the surrounding contours, and erosion prevention and maintenance of current hydrology will be necessary. In addition to reclamation seeding, depending on site specific needs, structured construction scheduling, surface roughening, erosion control blankets, straw wattles/bales, rolls, tackifiers (*i.e.*, chemical compounds that increase the stickiness of

adhesives so as to help seed or soil stay in place), mulch, vegetative buffers, hydromulch, sediment fencing, and waterbars may be used to manage soil erosion. In some cases, a narrower construction corridor may be considered to minimize impact. Temporary (annual) seed may be used to help prevent erosion. A BMP Selection Summary is presented in the following table.

Table 8.16.5: BMP Selection Summary

BMP Category	Grade or Trigger	BMP to Use
Erosion Prevention	Throughout	Vegetation preservation
		Vegetative buffers
		Scheduling
		Surface roughening
		Erosion control blanket
		Tackifiers
		Mulch
		Hydromulch
Slope Breakers	5%–15% slope (300-foot (91-meter) spacing)	Straw wattles
		Waterbars
		Straw bale check dams
	>15%-30% slope (200-foot (61-meter) spacing)	Straw wattles
		Waterbars
		Straw bale check dams
	>30% slope (100-foot (31-meter) spacing)	Straw wattles
		Waterbars
		Straw bale check dams
Sediment Barrier	At waterbody crossings	Sediment fencing
		Straw wattles
		Low water crossings
		Vegetative buffers
		Straw bale check dams

The type of control measure will vary depending upon slope gradients and the susceptibility of soil to wind and water erosion. The aforementioned BMPs will not only be employed to protect topsoil and minimize soil erosion, but will also protect surface water quality and floodplain resources from direct and indirect impacts. A SWPPP will be developed and a NPDES permit will be obtained prior to construction. BMPs will be employed to ensure that excavated material is contained, exposed soil is protected, restored material is stabilized and disturbed areas are re-vegetated with non-invasive species. Use of BMPs will also ensure that access roads and drainage ways will be designed in a manner that allows water to flow unrestricted from upper portions of the watershed to lower portions of the watershed. Significant adverse Project-related

impacts to surface waters and/or floodplains are not anticipated because of design considerations and the implementation of stormwater BMPs.

While dewatering is not anticipated, it can readily be implemented in conjunction with deep foundation installation. Sediment basins and filters can help filter the dewatered water before it is discharged to a surface water within uplands. Dewatering would be conducted in a manner such that the velocity of the discharged water would not cause scouring of the receiving area. If the receiving area is a structural BMP (*i.e.*, basin or sump), the design of the BMP should be based on the anticipated flow from the dewatered area. Should dewatering occur, mitigation measures to address dewatering would include measures such as the following to ensure sediment laden water will not be directly discharged to surface waters. Reducing the turbidity of water can be addressed by the following measures:

- Constructing a temporary sediment trap for turbine water discharge pretreatment.
- Use of a portable sediment containment system such as dumpsters.
- Application of natural based flocculent technology such as chitosan in sediment traps or a series of ditch checks to contain sediment.
- Discharge water through a series of fiber logs or a rock weeper into a large, vegetated buffer area.
- Provide energy dissipation and erosion control BMPs at all discharge points.
- Utilize a dewatering bag to ensure discharged water does not contribute sedimentation to receiving waters.

In addition to the mitigation measures listed above, the Project Area is within federally designated critical habitat for the Topeka shiner (*Notropis topeka*) (USFWS 2017a). Specific Topeka shiner management minimization recommendations for the Big Sioux River and Rock River Watersheds (approximately 47.7% of the Project Area) have been developed by the USFWS Twin Cities Field Office (2016) and include (but are not limited to) the following:

- Do not dewater or temporarily divert streams for construction;
- Do not conduct in-stream work before August 15 to avoid disrupting spawning;
- Follow all applicable requirements and best management practices for stormwater permits from the Minnesota Pollution Control Agency (MPCA);
- Minimize removal of riparian vegetation;
- Mulch areas of disturbed soil and reseed promptly;
- Implement appropriate erosion and sediment prevention measures;
- Ensure that erosion control features are in place;
- Design and install instream structures (*e.g.*, box culverts) in a manner that will not impair passage of Topeka shiners after construction is completed;
- Do not operate motorized vehicles instream;
- Backfill placed in the stream shall consist of rock or granular material free of fines, silts, and mud; and
- Prevent materials and debris from falling into the water during construction.

Additional details regarding Topeka shiners in the context of the Project Area are discussed further in Section 8.19.

If impacts to PWI surface waters are unavoidable, the Applicant will apply for the necessary permits prior to construction and will work with officials to minimize adverse impacts. Also, in Section 8.17.1 and 8.17.3 there is additional information regarding regulatory agencies and potential use of compensatory mitigation methods for the impacts to features.

8.17 Wetlands

8.17.1 Description of Resources

The Project Area contains both isolated wetlands and wetlands associated with watercourses scattered across the Project Area. The Project Area is dominated by freshwater emergent wetlands with some mapped emergent, shrub/scrub, and forested wetlands (see **Map 23 - National Wetland Inventory Update for Minnesota**). Some wetlands within agricultural settings appear to exhibit anthropological disturbance. Based on aerial photograph interpretation, a moderate number of the aforementioned wetlands would likely be considered jurisdictional WOUS due to their proximity to the Red or Minnesota Rivers.

According to the MNDNR update to the USFWS National Wetland Inventory (NWI) database, the Project Area contains approximately 2,031.8 acres (822.2 hectares) of mapped NWI wetlands and open waterbodies (7.9% of the Project Area) (MNDNR 2017e, USFWS 2017b). Wetland types and their associated acreages are illustrated in Table 8.17.1.

Table 8.17.1: NWI Wetland Type and Acreage

NWI Type	Acres	Percent of Project Area
Freshwater Emergent Wetland (PEM)	1,744.9 (706.1 hectares)	6.8%
Freshwater Forested/Shrub Wetland (PFO/PSS)	40.7 (16.5 hectares)	0.2%
Freshwater Pond (Open Waters)	74.7 (30.2 hectares)	0.3%
Riverine Waters	171.5 (69.4 hectares)	0.7%
Total:	2031.8 (822.2 hectares)	7.9%

Calcareous fens are a rare (*e.g.*, approximately 200 known locations within Minnesota) and distinctive wetland type characterized by non-acidic peat with a constant supply of calcium and magnesium bicarbonate rich groundwater. This specialized environment is dominated by a calcium-loving plant community (MNDNR 2016). Calcareous fens have been identified in the vicinity of the Project Area (northeast of the Town of Holland), and one calcareous fen has been identified within the Project Area. Calcareous fens are protected under both federal (Section 404 of the Clean Water Act) and state law (Minnesota Wetland Conservation Act) (MNDNR 2016).

In the State of Minnesota, some wetlands are designated as Public Water Inventory Basins (PWI Wetlands). All PWI Wetlands are identified as Types 3, 4, and 5 as defined by the USFWS Circular 39 (USFWS 1971) and that are 10 acres or more in size in rural areas and two and one half acres in size in incorporated areas. There are approximately 180.1 acres (72.9 hectares) of Type 3 wetlands; 46.4 acres (18.8 hectares) of Type 4 wetlands, and 26.3 acres (10.6 hectares) of Type 5 wetlands within the Project Area. There are three PWI Wetlands mapped within the Project Area as shown on **Map 21 (Surface Water)**. No project infrastructure is planned within PWI Wetlands and the Project will avoid impacts to PWI Wetlands.

In the State of Minnesota, agencies representing three levels of government (federal, state, and local) regulate certain activities that affect wetlands, lakes, and watercourses. Most other wetlands not listed in the PWI are regulated under the Minnesota Wetland Conservation Act of 1991. The WCA is administered by the Minnesota Board of Water and Soil Resources and is implemented by Local Government Units (LGU). The LGU administering the WCA within the Project Area is the Soil & Water Conservation District of Pipestone County. Generally, an LGU Replacement Plan is required by the WCA for an impact that wholly or partially drains or fills a wetland). Wetlands are also federally protected under Section 404 of the Clean Water Act. A wetland permit from the USACE is required when discharging dredged or fill material into jurisdictional wetland and/or non-wetland WOUS. A permit and/or pre-construction notification may also be required by the local watershed district depending upon the location, size and type of impact.

8.17.2 Potential Impacts

Turbines and meteorological towers will be sited in upland, higher elevation areas to maximize the wind resource and, as such, are likely to avoid wetlands and surface waters that are typically found at lower elevations. Access roads and Project-related infrastructure will be designed and sited to avoid or minimize permanent impacts to wetlands to the greatest extent possible. Temporary impacts to wetlands may occur based on construction easement extents. Field work to delineate wetlands is ongoing so that wetland areas can be avoided. In the event that permanent or temporary wetland impacts cannot be avoided during the siting of project infrastructure, Lake Benton Wind II will coordinate with the appropriate agencies including USACE, WCA, and the Soil & Water Conservation District of Pipestone County.

8.17.3 Mitigation Measures

During the design phase of the Project, measures will be taken to avoid impacts to wetland areas, where possible, and to minimize impacts to wetlands in cases where the impacts cannot be avoided. Results of the wetland desktop analysis and micro-siting field event will be considered by Lake Benton Wind II in an effort to avoid siting Project components in wetlands to the maximum extent practicable. Directional drilling of collector and communication lines may be utilized to avoid or reduce the amount of acreage where wetland impacts occur. .. If adverse impacts to wetlands are unavoidable, the impacts will be minimized to the maximum extent practicable. BMPs will be employed to protect topsoil, minimize soil erosion, and protect wetland resources from direct and indirect impacts. Minimizing soil erosion near wetlands helps to protect the wetland water quality, reduces the likelihood for fill of the wetland, and helps to maintain the integrity of the wetland. Wetland soils and moderately to steeply sloped ground can also be subject to sheet and rill erosion or slumping. Depending on site specific needs, seasonal construction scheduling, cutting trees where the stumps remain, temporary timber matting, erosion control blankets, mulch, straw bales, rolls, tackifiers (*i.e.*, chemical compounds that increase the stickiness of adhesives so as to help seed or soil stay in place), temporary seeding, hydromulch, and sediment fencing may be used to manage soil erosion. In some cases, a narrower construction corridor may be considered to minimize impact.

A SWPPP and NPDES permit will be obtained prior to construction. BMPs will be employed to ensure that excavated material is contained, exposed soil is protected, restored material is stabilized and disturbed areas are re-vegetated with non-invasive species. Significant adverse Project-related impacts to wetlands are not anticipated because of design considerations and the implementation of stormwater BMPs. Compensatory mitigation may be required if certain state and/or federal impact thresholds are surpassed. Currently, compensatory mitigation is not anticipated for the development of the Project.

8.18 Vegetation

8.18.1 Description of Resources

The Project Area is located within the Prairie Parkland Province, which was the part of the state that historically was dominated by tallgrass prairie (MNDNR 2017c, f). This Province is further divided into Sections and Subsections. The WRA is within the North Central Glaciated Plains Section (251B), characterized by mainly treeless fire-dependent communities, with upland prairie communities in a level to rolling region of calcareous till landscape (MNDNR 2017g), and the Inner Coteau Subsection (251Bc) historically dominated by tallgrass prairie and dry prairies over shallow bedrock (MNDNR 2017h, c).

The 2011 National Landcover Database – Land Use-Land Cover dataset (Homer et al. 2015) indicates that the Project Area contains approximately 16,057 acres (6,498 hectares) of cultivated land or about 63% of the Project Area. In addition to cultivated lands, agricultural regions

typically also include idle lands, pastures and grasslands. The 2011 National Landcover Database – Land Use-Land Cover dataset indicates that the Project Area contains approximately 720 acres (291 hectares) of pastures, or approximately 2.8% of the Project Area, and approximately 7,172 acres (2,902 hectares) of grassland/herbaceous habitat, or approximately 28% of the Project Area (see **Map 18 - Land Cover**). Grasslands, areas used as pastures, filter strips (*i.e.*, buffer strips), or areas that are not actively farmed, can have the ecological functions of grasslands. These grassy areas can serve the same purpose as native prairie, providing valuable habitat for grassland nesting or foraging birds. The remaining land cover type within the Project Area consists primarily of developed/disturbed space.

Table 8.18.1: Land Cover Types and Their Relative Abundance in the Project Area

Land Cover	Sum of Area (Acres)	Percent of Project Area
Cultivated Crops	16,057.4 (6,498.2 hectares)	62.7%
Grassland	7,171.9 (2,902 hectares)	28%
Hay/Pasture	720.3 (291.5 hectares)	2.8%
Disturbed/Developed	1,207.7 (488.7 hectares)	4.7%
Open Water	70.6 (28.6 hectares)	0.3%
Wetlands	316.3 (128.0 hectares)	1.2%
Deciduous Forest	47.9 (19.4 hectares)	0.2%
Barren Land	2.9 (1.2 hectares)	0.01%
TOTAL	25,596.9 (10,358.7 hectares)	100%

Sites of Biodiversity Significance

The Minnesota Biological Survey (MBS) identifies 25 Sites of Biodiversity Significance that are located completely within and/or overlap the Project Area (see **Map 24 - Unique Natural Features**). The MBS uses four classifications denoting the level of biological diversity to rank sites. These rankings are “outstanding”, “high”, “moderate”, and “below”. While sites ranked “outstanding” contain the highest probability of occurrence likelihood of the rarest species (including rarest native plant communities or the most intact native ecosystem), sites ranked “below” have low probability of occurrence likelihood of rare species, intact ecological communities, or are highly disturbed. The “high” and “moderate” rankings fall in between these classifications (MNDNR 2017i). The aforementioned rankings are used to communicate native biodiversity significance to natural resource professionals, state and local government officials, and the public as well as to guide conservation and management of the State’s natural resources.

One of the MBS Sites of Biodiversity Significance within the Project Area has been given an “outstanding” biodiversity significance ranking, six sites are ranked as “high”, nine sites are ranked as “moderate”, and nine sites are ranked as “below”. Table 8.18.1a below shows MBS Sites of Biodiversity Significance, and their associated acreage, that occur within the Project Area.

Table 8.18.1a: Sites of Biodiversity Significance within the Project Area

Site of Biodiversity Significance	Number of Sites Within Project Area	Acres
Outstanding	1	472 (191 hectares)
High	6	1,387 (561 hectares)
Moderate	9	1,485 (601 hectares)
Below	9	615 (249 hectares)

Native Plant Communities

Six native plant communities are located within the Project Area (see **Map 24 - Unique Natural Features**). One (1) native plant community type consisting of bulrush marsh (MRp93a; 37.3 acres (15.1 hectares)), ranked as Critically Imperiled (S1) community type and Condition “NR” (Not Ranked) is located within the southern portion of the Project Area west of Woodstock WMA. A native plant community type classified as a calcareous fen (OPp93b; 1.0 acres (0.4 hectares)), ranked as Imperiled (S2) and Condition “B” (good ecological integrity), is located within the Project Area near the western boundary. Native plant community type WMp73a

(164.6 acres or 66.6 hectares), Prairie Meadow/Carr, ranked as Vulnerable to Extirpation (S3) and Condition “C” (fair ecological integrity) is found in several locations in the central and southeastern portions of the Project Area. The remaining three native plant communities within the Project Area are native prairies (see Table 18.8.1b below for a breakdown of approximate acreage and ecological classification for these prairies).

MNDNR has assigned a biodiversity rank to these communities. Table 18.8.1b below provides the acreage and biodiversity ranking associated with the six plant community types present in the Project Area.

Table 18.8.1b: Native Plant Community Types within the Project Area

Native Plant Community Type	Acreage within Project Area by Biodiversity Rank		
	Outstanding	High	Moderate
MRp93a – Bulrush Marsh	N/A	37.3 acres (15.10 hectares)	N/A
OPp93b – Calcareous Fen	N/A	1.0 acre (0.4 hectares)	N/A
WMp73a – Prairie Meadow/Carr	48.7 acres (19.7 hectares)	56.8 acres (23.0 hectares)	59.1 acres (23.9 hectares)
UPs23a – Mesic Prairie (Southern)	N/A	5.58 acres (2.26 hectares)	N/A
UPs13d – Dry Hill Prairie (Southern)	262.5 acres (106.2 hectares)	424.7 acres (171.9 hectares)	180.4 acres (73.0 hectares)
WPs54b – Wet Prairie (Southern)	13.7 acres (5.5 hectares)	2.3 acres (0.9 hectares)	30.6 acres (12.4 hectares)

Native Prairie

As covered in the discussion on native plant communities, the MNDNR has mapped 49 native prairies within the Project Area. The 49 mapped prairies consist of three different classifications. Forty-four (44) of these prairies are classified as UPs13d, Dry Hill Prairie (Southern). The MNDNR describes this prairie type as grass dominated, but forb rich, occurring on medium- to fine-textured soils on moderate to steep slopes in glacial till or loess-mantled till (MNDNR 2017j). The Dry Hill Prairie (Southern) prairie type makes up approximately 868 acres (351 hectares) within the Project Area.

Four (4) prairies are classified as WPs54b, Wet Prairie (Southern), accounting for approximately 47 acres (19 hectares) of the Project Area. The MNDNR describes this prairie type as grass dominated, but forb rich, occurring on poorly drained to very poorly drained loam soils formed in lacustrine sediments, unsorted glacial till, or less frequently outwash deposits. Saturation typically persists in the lower part of the rooting zone for much of the season (MNDNR 2009). One (1) prairie is classified as UPs23a, Mesic Prairie (Southern), and is characterized as grass dominated, forb rich, and occurring on somewhat poorly drained to well-drained loamy soils (MNDNR 2017j). This prairie type accounts for approximately six (6) acres (2 hectares) of the Project Area.

8.18.2 Potential Impacts

Vegetation will be removed during construction and installation of Project infrastructure to allow for construction of turbine pads, access roads, substation, and O&M facilities. Lake Benton Wind II will design the site to place the majority of Project infrastructure in agricultural fields. Less than 2 percent of the total Project Area will be permanently converted to sites for wind turbines or other Project infrastructure. Table 8.18.2 below details anticipated permanent impacts to vegetation and unique vegetation types within the Project Area. Project infrastructure will be sited so as to avoid Sites of Biodiversity Significance that are ranked high or outstanding. For those Sites of Biodiversity Significance ranked moderate or below, field verification as to whether these sites meet the criteria for these rankings has occurred and will continue as project details are developed. Should project infrastructure be planned in areas with moderate or below rankings, Lake Benton Wind II will coordinate with MNDNR regarding potential impacts to these areas. Mapped Native Plant Communities will be avoided to the extent practical. Where project infrastructure is planned in these areas, field verification as to whether these areas exhibit native plant communities has occurred and will continue as project details are developed. Should infrastructure be planned in areas mapped as Native Plant Communities, it will be coordinated with MNDNR. The Project has been designed to avoid temporary and permanent impacts to Native Plant Communities. If the location of Project infrastructure shifts within the Project Area, Lake Benton Wind II will attempt to avoid impacts to Native Plant Communities and will coordinate with MNDNR as appropriate.

Table 8.18.2: Summary of Estimated Permanent Impacts to Vegetation

Land Cover Type	Turbines (acres/ hectares)	Access Roads (acres/ hectares)	O&M Facility (acres/ hectares)	Total (acres/ hectares)
Cultivated Crops	3.58/1.45	16.25/6.5 7	5.01/2.03	24.83/10.05
Hay/Pasture	0.12/0.05	0.15/0.06	0	0.27/0.11
Developed, Open Space	0	0.50/0.20	0	0.50/0.20
Developed, Medium Intensity	0	0.01/0.00 5	0	0.01/0.005
Herbaceous	1.36/0.55	8.23/3.33	0	9.59/3.88
Native Plant Community	0	0	0	0
Total	5.05/2.05	25.14/10. 18	5.01/2.03	35.20/14.25

Temporary vegetation impacts will occur during construction and will be associated with such activities as contractor laydown and staging areas, crane walkways, and the installation of underground collection lines. As ground will be disturbed by equipment deliveries from different geographic areas, introduction of noxious weeds may occur, though Lake Benton Wind II will work collaboratively with all Project construction parties to minimize and prevent the introduction of invasive species. Direct permanent and temporary impacts to natural areas and sensitive vegetation will be avoided and minimized.

8.18.3 Mitigation Measures

Lake Benton Wind II will make every effort to avoid direct permanent and temporary impacts to natural areas, including wetlands, native plant community types, and MBS Sites of Biodiversity Significance within the Project Area, including native prairie. Additionally, Lake Benton Wind II will avoid impacts to conservation land such as WMAs. Approximately 71% of turbines are planned on lands currently under crop cultivation. Access roads are expected to impact agricultural fields and, potentially, grassed areas associated with roadsides and ditches, while avoiding grasslands, shrubland, and wooded areas. Access road construction or collection line installation may result in some temporary impacts to unavoidable drainages, grasslands, shrublands, and wetlands. Lake Benton Wind II will coordinate with the local NRCS office to ensure the reseeding of these areas with locally sourced native mixes should these impacts occur.

during construction activities. Lake Benton Wind II will prepare a prairie protection and management plan in consultation with the MNDNR. The prairie protection plan will detail efforts to avoid impacts to prairies through site design. Additionally, any impacts expected to occur to MBS Sites of Biodiversity Significance will be coordinated with MNDNR as appropriate. Lake Benton Wind II will implement BMPs for all Project construction entities entering the Project Area to control and prevent the introduction of invasive species as designated by the Minnesota Department of Agriculture (MDA 2017). These BMPs include limiting invasive species spread via maintenance equipment and vehicles via early detection of invasive species, cleaning mowers and bladed equipment, minimizing disturbance to native areas, limiting traffic through weed-infested areas, if possible, and frequently inspect equipment storage areas for weeds. In the event that invasive weeds are detected within the Project control via properly timed cutting and targeted herbicide use will be conducted in keeping with the herbicide BMPs published by the MnDOT and MDA (MDA 2017, MnDOT 2017b).

8.19 Wildlife Resources

The USFWS Land-based Wind Energy Guidelines were issued on March 23, 2012 to provide a structured and scientific approach to wildlife concerns at all stages of land-based wind energy development (USFWS 2012). The guidelines use a tiered approach of collecting information, with each tier increasing in the detail of research and information. The tiered approach provides the opportunity for evaluation and decision-making at each step of the Project to enable the developer to abandon or proceed with development, or to collect additional information. The tiers are briefly outlined as follows:

- Tier 1 – Preliminary, landscape-level evaluation of a site or sites for habitat for species of concern using readily and publicly available sources of information.
- Tier 2 – Site characterization that involves detailed site and database research, as well as a site reconnaissance visit by a qualified biologist.
- Tier 3 – Field studies to document wildlife conditions at the site and predict Project impacts. These can include avian point count surveys, raptor nest surveys, and eagle surveys.
- Tier 4 – Post-construction mortality monitoring.
- Tier 5 – Other post-construction studies that the developer, in conjunction with USFWS, may deem important on-site.

Appendix I, Ia and Ib (Wildlife Studies) contains a copy of each of the Tier 3 studies. It is important to note that depending on each tier's findings, not all tiers are recommended or necessary for all projects.

Results of Tier 1 and Tier 2 Studies

A Tier 1 and Tier 2 Site Characterization Study (SCS) was completed for the Project Area in November 2017 (Atwell 2017). Information for this study was gathered through MNDNR and

USFWS database research, additional resources and a site visit by a qualified biologist in January 2017. Tier 1 questions help determine potential environmental risk at the landscape scale, while Tier 2 questions help to determine potential environmental risk at the project scale (USFWS 2012). For additional detail on the SCS see **Appendix H (Site Characterization Study)**.

8.19.1 Potential and Observed Wildlife Usage

Information on existing wildlife within the Project Area was obtained through various sources including: MNDNR; USFWS; Minnesota Breeding Bird Atlas; avian use pre-construction surveys (initiated in September 2016); site reconnaissance; and an aerial raptor and eagle nest survey. See Table 8.19.1 for a summary of the Tier 3 wildlife studies that were completed for the Project Area. The following section includes a discussion on general wildlife within the area. This section includes a discussion of wildlife that is considered threatened, endangered or of special concern.

Table 8.19.1: Tier 3 Wildlife Studies

Study Type	Completed By	Year
Year 1 Avian Use Study	WEST, Inc.	2016-2017
Bald Eagle and Raptor Aerial Nest Survey	WEST, Inc.	2017

Birds

Two types of avian pre-construction surveys including fixed-point avian use surveys and an aerial raptor nest survey were conducted over a 12 month period within the Lake Benton Wind II Project. Survey methods follow those outlined in the USFWS Land-Based Wind Energy Guidelines (USFWS 2012) and are consistent with the Eagle Conservation Plan Guidance document (USFWS 2013).

Fixed-point avian use survey

Fixed-point avian use field studies were conducted for 12 consecutive months from September 2016 to August 2017 at 16 points within the Project Area. A total of 192 surveys were conducted during the 12-month period where 74 unique species were observed (**Appendix I, Appendix Ia and Ib– Wildlife Studies**). The most abundant species observed were Canada goose (*Branta canadensis*) and snow goose (*Anser caerulescens*). Large flocks of mixed species of blackbirds were also observed during the fall of 2016. Species richness for small birds was highest in the summer and lowest in the winter. Small bird use within the Project Area was highest in fall (37.23 birds/100-m (328-ft.) plot/10-min survey, primarily due to large flocks of

blackbirds) and lowest in winter (5.46 birds/100-m (328-ft.) plot/10-min survey). Species richness for large birds was highest in spring and lowest in summer. Large bird use (e.g., raptors, waterfowl, and waterbirds) within the Project Area was highest in winter (43.9 birds/800-m (2,625-ft.) plot/60-min survey, due to large flocks of Canada geese and snow geese in late winter) and lowest in summer (4.0 birds/800-m (2,625-ft.) plot/60-min survey); use in fall (17.9 birds/800-m (2,625-ft.) plot/60-min survey) and spring (16.6 birds/800-m (2,625-ft.) plot/60-min survey) was intermediate.

Through the course of the year, eight (8) species of diurnal raptor were observed during large bird surveys: sharp-shinned hawk (*Accipiter striatus*), red-tailed hawk (*Buteo jamaicensis*), rough-legged hawk (*Buteo lagopus*), Swainson's hawk (*Buteo swainsoni*), northern harrier (*Circus cyaneus*), bald eagle (*Haliaeetus leucocephalus*), American kestrel (*Falco sparverius*), and merlin (*Falco columbarius*). Diurnal raptor use was highest during spring (0.75 birds/800-m (2,625-ft.) plot/60-min survey), followed by fall (0.65 birds/800-m (2,625-ft.) plot/60-min survey), summer (0.56 birds/800-m (2,625-ft.) plot/60-min survey), and winter (0.08 birds/800-m (2,625-ft.) plot/60-min survey). Red-tailed hawk made up most of the diurnal raptor use during fall, spring, and summer; diurnal raptor use in the winter was comprised of single observations of bald eagle, American kestrel, merlin, and an unidentified raptor.

During each survey, the flight paths of large birds were documented to create a record of spatial use within the project. Documented flight paths of large birds do not indicate that any portion of the Project Area supports more use than other areas. The majority of use documented in these surveys was by waterfowl which were observed moving through the Project Area during their spring and fall migration periods.

No federal or state threatened or endangered species were observed during the surveys. Three (3) special status species were documented including: American white pelican (*Pelecanus erythrorhynchos*; Minnesota special concern), Franklin's gull (*Leucophaeus pipixcan*; Minnesota special concern), and bald eagle (*Haliaeetus leucocephalus*; Bald and Golden Eagle Protection Act). Franklin's gull and American white pelican were observed only during migration periods. Six (6) bald eagle observations occurred within the southern half of the Project Area during late winter, spring, and summer, with four (4) eagles observed during fixed –point surveys; two (2) additional bald eagles were observed incidentally as biologists traveled between survey locations within the Project Area. Over the 192 hours of surveys, 30 bald eagle minutes were recorded, of which eight (8) minutes (5 minutes in March; 3 minutes in June) documented eagle flight within 800 m (2,625-ft.) and below 200 m (656-ft.) in height (i.e., the area of risk important for assessing eagle exposure rate under the Eagle Conservation Plan Guidance).

Aerial raptor nest survey

Aerial surveys were conducted from a helicopter to identify raptor and eagle stick nests within and near the Project Area. Surveys were conducted in the period before leaf-out when raptors

are typically attending nests. In 2017, surveys were conducted on the following dates: March 29-30, April 2, and April 4, 2017. Surveys within the Project Area and a one-mile buffer of the Project Area documented all potential raptor nests, including bald eagles, while the surveys out to the ten-mile buffer of the Project Area focused only on identifying large stick nests that could be potential bald eagle nests. A total of 24 raptor nests representing three (3) raptor species were detected during the aerial survey. No eagle nests were documented within the Project Area. Two (2) active bald eagle nests were observed at 7.6 and 7.7 miles (12.2 and 12.4 kilometers) respectively outside the Project Area within the surveyed 10-mile buffer (16-kilometer). Additional raptor stick nests documented during the survey included two (2) occupied and active great horned owl (*Bubo virginianus*) nests, five (5) occupied and active red-tailed hawk stick nests, one (1) occupied and active stick nest with a Canada goose, two (2) occupied and active stick nests of unknown smaller raptor species, one (1) occupied and inactive stick nest of an unknown species, and 11 unoccupied and inactive stick nests of unknown species.

Mammals

Many common mammal species are likely to utilize the Project Area, including white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), coyote (*Canis latrans*), red and gray fox (*Vulpes fulva* and *Vulpes urocyon*), Virginia opossum (*Didelphis virginiana*), gray squirrel (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), striped skunk (*Mephitis mephitis*), short-tailed weasel (*Mustela erminea*), and badger (*Taxidea taxus*) (**Appendix H - Site Characterization Study**). The larger mammal species are most likely to utilize the wooded areas and uncultivated grassland areas that are present within the Project Area, while the smaller mammal species are likely to use those areas as well as the cultivated areas within the Project Area.

Since the existing Lake Benton II Project was constructed prior to the release of the Wind Energy Guidelines, pre-construction bat surveys were not conducted. Post-construction studies of the original Lake Benton II Project (previously referred to as Buffalo Ridge Phase III) occurred from 1998 – 1999, and in 2001 and 2002. A total of 44 bat fatalities were detected in this Phase III area in 1999, 46 were found in 2001 and 25 were found in 2002 (Johnson et al. 2000, 2004). The majority of fatalities were tree bats, most of which were hoary bats (*Lasiurus cinereus*); smaller numbers of eastern red bats (*Lasiurus borealis*), big brown bats (*Eptesicus fuscus*), silver-haired bats (*Lasionycteris noctivagans*) and little-brown bats (*Myotis lucifugus*) were also documented. No northern long-eared bats (NLEB, *Myotis septentrionalis*; currently listed as federally threatened; Minnesota special concern) or tri-colored bats (*Perimyotis subflavus*, Minnesota special concern) were documented in any of the post-construction studies. Two (2) additional bat species which are now Minnesota species of special concern were observed during the previous post construction monitoring at the existing Lake Benton II Project, big brown bat and little brown bat (Johnson et al. 2000, 2004).

A desktop assessment was conducted to evaluate the potential for NLEB presence in the Project Area during the summer season following the NLEB January 2014 Interim Conference and Planning Guidance (USFWS 2014a). This assessment quantified habitat patches that could serve as NLEB habitat during the summer season, including: 1) commuting/travel habitat (*i.e.*, 0 – 14 acres [ac] (0 – 6 hectares [ha]) in size), 2) small roost/foraging habitat (*i.e.*, 15 – 49 ac (6 – 20 ha) in size), and 3) medium/large roosting/foraging habitat (*i.e.*, 50+ ac (20 + ha) in size). The habitat mapping effort indicates that there is one planted woodland within the northwestern portion of the Project Area which could serve as a corridor habitat during the summer (Figure 10, **Appendix J – Wildlife Conservation Strategy**). However, because there are no waterbodies in the vicinity of the wooded corridor and the surrounding area is primarily cropland and grazed pasture, it is anticipated that the summer use by NLEB is likely low. During migration periods when the species is not strongly associated with wooded habitat, NLEB may fly through the Project Area, similar to elsewhere in their range.

To assess current levels of bat activity, acoustic bat surveys consisting of three (3) ground-based acoustic detectors located in the Project Area are planned for survey deployment in April - October 2018.

Refer to Section 8.19.2 for a discussion on federally or state designated conservation concern species.

Reptiles and Amphibians

A variety of reptiles and amphibians may be present within the Project Area, such as the American toad (*Anaxyrus americanus*), northern leopard frog (*Lithobates pipiens*), western chorus frog (*Pseudacris triseriata*), painted turtle (*Chrysemys picta*), snapping turtle (*Chelydra serpentina*), wood turtle (*Glyptemys insculpta*), prairie skink (*Plestiodon septentrionalis*), and the common and plains garter snake (*Thamnophis sirtalis* and *Thamnophis radix*) (**Appendix H - Site Characterization Study**). Most of the species listed here live in habitats associated with wetlands, streams and ditches. A few of the aforementioned species (*e.g.*, wood turtle and garter snakes) may be found in open areas, such as grasslands or fallow agricultural fields.

Insects

The Project Area has the potential to harbor a number of federally and state listed insect species such as the Dakota skipper (*Hesperia dacotae*; federally threatened and state endangered), Poweshiek skipperling (*Oarisma poweshiek*; federally threatened and state endangered), and ottoe skipper (*Hesperia ottoe*; state endangered) (**Appendix H - Site Characterization Study**). Habitat requirements for these species are very specific and consist exclusively of native prairie. The habitat preferences of these insects largely overlap one another and grassland habitats dominated by non-native grasses are generally not suitable for these species. There are 49 MNDNR mapped native prairies within the Project Area that may provide suitable habitat for these listed insect species. Furthermore, two federally designated critical habitat units for the

Dakota skipper and one federally designated critical habitat unit for the Poweshiek skipperling occur within the Project Area.

A desktop analysis aimed at identifying suitable habitat for the Dakota skipper and Poweshiek skipperling was conducted within the Project Area in June 2017 (SWCA Environmental Consultants 2017). The desktop analysis identified a patchwork of potentially suitable habitat for these species within the Project Area. Given the similar habitat preferences of the ottoe skipper, it is likely that suitable habitat for the ottoe skipper is also present within the Project Area.

8.19.2 Rare and Unique Natural Features

Threatened and Endangered Species

The USFWS provides distribution lists of federally-listed threatened, endangered, and candidate species on a county-by-county basis. The USFWS county list indicates that Pipestone County is within the range (*i.e.*, has documented records, harbors critical habitat, and/or has the potential to harbor critical habitat for the designated species) of the federally threatened northern long-eared bat, western prairie fringed orchid (*Platanthera praeclara*), and Dakota skipper, and the federally endangered Topeka shiner (USFWS 2017a). In the state of Minnesota, the western prairie fringed orchid and the Dakota skipper are also listed as state endangered. See Table 8.19.2 below for the USFWS IPaC results.

Table 8.19.2: Federally Listed Species Known to Occur in Pipestone County

Species	Federal Status
Northern Long-eared Bat	Threatened
Topeka Shiner	Endangered
Dakota Skipper	Threatened
Western Prairie Fringed Orchid	Threatened

The impetus for the listing of the northern long-eared bat by USFWS was primarily due to the threat posed by the white-nose syndrome (WNS), a fungal disease that has affected several bat populations (USFWS 2016). The decision to list the bat as threatened with a 4(d) rule provides protection to address conservation needs of this bat species (USFWS 2016). For areas in the United States where WNS affects bat populations, the conservation measures provided in the 4(d) rule exempt “take” (defined under the ESA as harming, harassing, or killing of protected species) as a result from certain activities (*i.e.*, wind turbine operation, forest management, maintenance of utility right-of-ways, tree/shrub removal for prairie maintenance, and limited

tree-removal activities, etc.) (USFWS 2016). The USFWS consider all Minnesota counties to be a part of the WNS zone as of June 30, 2017 (USFWS 2017c) and thus the Project Area is within the WNS zone. The 4(d) rule applies to the Project Area, but would only affect the project in terms of tree clearing restrictions if a roost tree was confirmed within the Project. According to publically available data, the closest known NLEB roost tree to the Project Area is approximately 160 miles (258 kilometers) to the northeast within Morrison County (MNDNR and USFWS 2017).

The northern long-eared bat ranges from eastern Quebec west to central Saskatchewan, Canada to northern Florida (Sparks et al. 2011, USFWS 2014a). In Minnesota, the northern long-eared bat is considered relatively common, likely to occur in the eastern half of the state within forested habitat (Baker 2016), and hibernate from mid-October to early April in caves and mines (USFWS 2015a). This species of bat has been known to be found in the same hibernacula as several other bat species, including the Indiana bat (*Myotis sodalis*). The closest northern long-eared bat hibernacula in Minnesota are located on the border between Nicollet and Le Sueur counties (approximately 105 miles (169 kilometers) to the east of the Project Area) (USFWS 2007, MNDNR and USFWS 2017). Although there is limited information on the movement of this species between winter and summer habitat, a maximum migration distance of 35 miles (56 kilometers) was reported farther south in the species' range (from Missouri), but further research may determine longer migrations (Boyles et al. 2009).

The northern long-eared bat roosts under bark, cavities, or crevices of dead and living trees during summer (Carter and Feldhamer 2005, USFWS 2015b). Summer roosting is generally sexually segregated; females form maternity colonies and males roost singly or in small groups in trees; however, colonies can be found in manmade structures as well (Boyles et al. 2009). Foraging habitat is generally located within forests interiors beneath the forest canopy, but above the shrub strata; however, northern long-eared bats have been known to forage over tallgrass prairie habitat where insects are gleaned from vegetation (Boyles et al. 2009). The bat may occur as a migrant within the Project Area, but the absence of high quality woodlands or floodplain forests within the Project Area limit the bat's likelihood to occur as a summering or wintering species within the Project Area.

The Topeka shiner is a federally endangered species that occurs in small prairie streams in pools containing clear, clean water (Berg et al. 2004). The Topeka shiner is known to occur in portions of South Dakota, Minnesota, Kansas, Iowa, Missouri, and Nebraska. Most Topeka shiner streams are perennial (flow year-round), but some are small enough to stop flowing during the drier summer months (MNDNR 2017l). Topeka shiner preferred habitat generally consists of streams with clean gravel, rock, or sand bottoms. The Topeka shiner is restricted to small, prairie streams that are tributaries to the Missouri River in Lincoln, Murray, Nobles, Pipestone, and Rock counties in southwestern Minnesota (MNDNR 2017l).

Final critical habitat was designated by USFWS for the Topeka shiner on July 27, 2004 and encompasses streams within the entirety of the Project Area and approximately 196 miles (315 kilometers) of 21 stream segments in Pipestone County, Minnesota (USFWS 2004). The closest NHIS occurrence records to the Project Area consist of two records within one mile of the Project Area along the southern and western margins of the Project Area (the most recent of which was in 2015). However, the USFWS Twin Cities Field Office has prepared specific recommendations for projects impacting waters containing Topeka shiners in Minnesota (USFWS-Twin Cities Field Office 2016). These recommendations are restricted to the Big Sioux River and Rock River watersheds within Pipestone County. These two watersheds make up approximately 48% of the Project Area. Refer to Section 8.19.6 for Topeka shiner impact mitigation and minimization measures.

The Dakota skipper is a federally-listed threatened species and state listed endangered species in Minnesota. The Dakota skipper is thought to prefer native drier prairie, where medium grasses are a major element of the vegetation. The most productive sites in Minnesota feature some topographic relief (Swengel and Swengel 1999). Adults will forage into nearby lowland prairie (mesic and wet prairie) for nectar. Final critical habitat was designated by USFWS for the Dakota skipper on October 1, 2015 and includes about 19,900 acres in units in Minnesota, North Dakota, and South Dakota (USFWS 2014b). Two federally designated critical habitat units for the Dakota skipper occur within the Project Area and are associated with Woodstock WMA East Unit in the eastern portion of the Project Area and Prairie Coteau SNA in the western portion of the Project Area. NHIS data reveals two (2) occurrence records at each of these designated critical habitat sites as recently as 2007/2008.

A desktop analysis aimed at identifying potential suitable habitat for the Dakota skipper and Poweshiek skipperling was conducted in June 2017. The desktop analysis, based off aerial imagery, identified a patchwork of potentially suitable habitat (remnant native prairie and wetlands) for both the Dakota skipper and Poweshiek skipperling scattered throughout the Project Area.

In recent decades, the skipper has disappeared from states to the south and east of Minnesota and has become increasingly rare and local in its remaining range (Cochrane and Delphey 2002). Despite recent targeted survey effort for this species, recent confirmed records of this species in western Minnesota have become very rare (MNDNR 2017k). However, these survey results provide a limited picture of the species, as this species' survey window is extremely limited each summer (a three week period from late June to mid-July during calm periods in the morning only). Furthermore, there are a very small number of qualified surveyors who can identify this inconspicuous species in the field. As a result this species does have the potential to occur in appropriate grassland habitats within the Project Area.

The Western prairie fringed orchid is a federally threatened and state listed endangered species in Minnesota. Western prairie fringed orchids are very local in their distribution and are largely

restricted to remnant native prairies or sedge meadows. These sites typically occur in full sunlight on moist till or sandy soils. There are very few remaining suitable sites for this orchid within its range as this species requires no cattle grazing and limited if any historical mowing for wild hay (MNDNR 2017m). Remnant native prairie and wetlands occur in the Project Area; however there are no NHIS records of this species within the Project Area or within one mile (1.6 kilometers) of the Project Area. As such, this species is expected to have a low chance of occurring within the Project Area.

The Applicant received a formal Natural Heritage Review letter from the MNDNR for the Lake Benton Wind II Project on July 18, 2017. In addition to the formal Natural Heritage Review letter from MNDNR, the Applicant queried the electronic database for rare species occurrences within one mile of the Project Area.

Results from the MNDNR NHIS database review for the Project Area indicated 15 records of nine different types of rare plants or animals within one mile of the Project Area boundary. The mapped occurrences include five records of vertebrate animals, seven records of invertebrate animals, and three records of vascular plants (see Table 8.19.2.1 below). The NHIS maintains that it is not an exhaustive inventory, and, thus, does not represent all occurrences of rare features within the state. In addition, ecologically significant features for which the NHIS has no records may exist within the Project Area.

Table 8.19.2.1: NHIS Species Recorded within One Mile of the Project Area

Type	State Status	Scientific Name	Common Name	Number of Mapped Occurrences within One Mile (1.6 kilometers) of Project Area	Year of Most Current Observation
Vertebrate Animal	State Endangered	<i>Athene cunicularia</i>	Burrowing Owl	1	1989
Vertebrate Animal	State Endangered	<i>Lanius ludovicianus</i>	Loggerhead Shrike	1	1995
Vertebrate Animal	State Threatened	<i>Emydoidea blandingii</i>	Blanding's Turtle	2	2007
Vertebrate Animal	State Threatened	<i>Fundulus sciadicus</i>	Plains Topminnow	1	2006

Type	State Status	Scientific Name	Common Name	Number of Mapped Occurrences within One Mile (1.6 kilometers) of Project Area	Year of Most Current Observation
Invertebrate Animal	Federal Threatened, State Endangered	<i>Hesperia dacotae</i>	Dakota Skipper	2	2008
Invertebrate Animal	State Endangered	<i>Hesperia ottoe</i>	Ottoe Skipper	1	1995
Invertebrate Animal	Federal Endangered, State Endangered	<i>Oarisma poweshiek</i>	Poweshiek Skipperling	4	2007
Vascular Plant	State Endangered	<i>Sagittaria brevirostra</i>	Short-beaked Arrowhead	1	2006
Vascular Plant	State Threatened	<i>Rhynchospora capillacea</i>	Hair-like Beak Rush	2	2006

It is important to note that some of the species listed are restricted to aquatic environments and are not expected to be impacted by development of the Project (*e.g.*, the plains topminnow is confined to creeks and small rivers). Typical construction BMPs will likely mitigate any potential impacts to aquatic species. Furthermore, several species identified are typically found in open, native prairies. Native prairie and open grasslands functioning as prairie are not anticipated to be impacted by development of the Project.

The MNDNR identified the possible occurrence of sensitive grassland breeding species, such as loggerhead shrike (*Lanius ludovicianus*; state endangered), as a possible development constraint in its July 18, 2017 Natural Heritage Review letter to Lake Benton Wind II (refer to **Appendix B - Agency Correspondence and Responses**). MNDNR requested that construction activities be avoided from late April through July where feasible to minimize potential impacts to these species.

Native Plant Community

Table 8.19.2.2: NHIS Native Plant Communities Recorded within One Mile of the Project Area

Native Plant Community Type	Number of NHIS Records within the Project Area	Number of NHIS Records within One Mile (1.6 kilometers) of the Project Area
Bulrush Marsh (Prairie)	1	1
Calcareous Fen	1	5
Dry Sand – Gravel Prairie (Southern)	0	4
Dry Hill Prairie (Southern)	44	47
Mesic Prairie (Southern)	1	1
Prairie Meadow/Carr	10	19
Wet Prairie (Southern)	4	5

The MNDNR has mapped rare and unique native plant communities as part of its NHIS database. These native plant communities have the potential to provide habitat for rare species of flora and fauna. The native prairie type habitats and calcareous fens native plant communities are both identified as a constraint by the MNDNR in the July 18, 2017 Natural Heritage Review letter. For additional details on these communities, please refer to the Vegetation and Wetlands portions of this document, in Section 8.17 and Section 8.18.

8.19.3 DNR Waterfowl Feeding and Resting Areas

No MNDNR Waterfowl Feeding and Resting Areas are located within or adjacent to the Project Area.

8.19.4 Important Bird Areas

The Important Bird Areas (IBA) program works to identify and conserve areas that are essential to birds and biodiversity. The program works with Audubon chapters, non-profit organizations, public agencies, and private landowners to manage and conserve land within the IBAs.

The Prairie Coteau IBA was designated to help protect remaining grassland habitat in southwestern Minnesota. The Prairie Coteau IBA is a complex of six (6) separate areas within the Prairie Pothole and Eastern Tallgrass Prairie Bird Conservation Regions, occurring mostly within Pipestone County, but with portions in Yellow Medicine, Lincoln, Murray, and Rock Counties. The six areas making up the IBA are not contiguous, though are ecologically similar and represent prairie and grassland bird habitat in a landscape that is otherwise highly fragmented and dominated by agriculture (National Audubon Society 2017).

Of the six separate areas that comprise the Prairie Coteau IBA complex, one area overlaps the Project, encompassing 57% of the Project Area, or 14,700 acres.

8.19.5 Potential Impacts

Field and desktop studies indicate that wildlife usage in the Project Area is comparable to that documented at other wind energy conversion systems sited in agricultural areas of the Midwest. Impacts to wildlife and wildlife habitat are expected to be minimal because grasslands, wooded areas, shrublands and other areas identified as important to wildlife will be avoided whenever possible. Additionally, these important wildlife features occur in relatively small amounts within the Project Area. The micrositing process will allow Lake Benton Wind II to identify and avoid important wildlife habitat resources. Additionally, minor impacts to grasslands, shrublands and wetlands that may occur as a result of Project construction will be temporary in nature. Construction and operation of the Project is not expected to change land use within, or adjacent to, the Project.

Impacts to wildlife would primarily occur to avian and bat populations. It can be expected that there is a likelihood that bird and bat fatalities will occur at the Project, but these fatalities are unlikely to affect populations of most species, including species of a conservation concern. However, impacts to birds and bats as a result of Project construction and operation are not expected to differ markedly from those reported by other previous studies in agricultural settings within Minnesota.

Birds

This Project is a repowering of an existing facility and the current layout minimizes impacts to avian species and their habitats by concentrating activity in agricultural lands. By siting the repowering turbines in cultivated fields and designing the associated infrastructure to avoid or minimize impacts on the native plant communities, grasslands, wetlands, and streams, Lake Benton Wind II has designed the Project facilities to avoid and minimize impacts on species of concern and other avian species, including direct (mortality) and indirect (displacement, habitat loss and fragmentation) impacts. The repowering footprint as currently planned reduces the amount of grassland fragmented by turbines and roads, and minimizes avian displacement effects. Thus, adverse effects on avian species of concern and their habitats are not anticipated to occur as a result of construction and operation of the Project.

Thirty-one (31) species of birds were detected in post-construction fatality surveys at the currently operational turbines from 1996 - 1999 (Johnson et al. 2000). The majority (74%) of fatalities in the area were smaller birds, passerine species, such as warblers, sparrows, swallows, flycatchers, and blackbirds. The total adjusted fatality rate for birds (based on scavenger removal and searcher efficiency) at Phase III (now called Lake Benton II) was estimated to be 4.45 birds/turbine/year, or 5.93 birds/MW/year. Raptors fatalities were not documented at Lake Benton II and raptor fatality estimates are minimal for the region (Table 5 of **Appendix J – Wildlife Conservation Strategy**). It is anticipated that the fatality rate per MW would remain similar to other wind projects in southwest Minnesota.

The two species of Minnesota special concern (American white pelican and Franklin's gull) recorded in the 2016 -2017 avian use surveys were detected migrating through the Project Area and are likely to occur within or near the Project Area only during spring and fall migration. These species would not be expected to be observed during the breeding and nesting season as habitat within the Project Area is limited. While both of these species were seen during avian use counts in the four-year Buffalo Ridge Study (Johnson et al. 2000), none were documented as fatalities, indicating a relatively low risk of collision.

The site poses a relatively low risk to bald eagles due to lack of eagle use and suitable nesting or foraging habitat in the Project Area. In addition, abundant prey for eagles is not expected to be present within the Project Area. Limited foraging opportunities may be present in the form of carrion, livestock carcasses, small game within grasslands/croplands, and waterfowl that may stop in Project Area crop fields or in adjacent WMAs.

Bats

Bat fatality rates among wind energy facilities of the Buffalo Ridge area is relatively low compared to rates elsewhere in the Midwest (Johnson et al. 2004). Previously, bat fatalities at the Lake Benton II (previously referred to as Phase III) project were estimated to range from 2.04 bats/turbine/year (2.72 bats/MW/year) (Johnson et al. 2000), with similar estimates during subsequent years (3.71 bats/MW/year in 2001; 1.81 bats/MW/year in 2002) (Johnson et al. 2004). The repowering of the Project is not expected to result in bat fatalities at rates higher than similar facilities in areas dominated by agriculture with minimal forested habitat. As with other facilities in Minnesota, tree bats such as hoary bats and eastern red bats are anticipated to be at greatest risk of fatality. Risk to the federally listed NLEB is expected to be relatively low, due to the lack of suitable summer habitat and the fact that no fatalities have been found at the currently operating turbines. Results of post-construction studies after repowering will be compared to these rates, but it is expected that the per MW bat fatality rate will remain similar to facilities elsewhere in southwestern Minnesota which is generally low compared to other areas of the U.S.

Rare and Unique Natural Features

The majority of identified rare and unique natural features flagged during the MNDNR's NHIS data review for the Project Area are of grassland-associated invertebrates (butterflies) and vascular plants concentrated in the central third of the Project Area in association with existing state owned SNA and WMA properties and grassland dominated areas (see **Map 6 – Public Land Ownership & Recreation** and **Map 18 - Land Cover**). Pro-active avoidance of native grassland habitat and public lands within the Project Area has been suggested by the MNDNR to the greatest extent practicable. Furthermore, limiting impacts to native grassland and wetland areas during the construction and siting process will reduce the potential impacts for these rare and unique natural features (*e.g.*, Dakota skipper and any other listed plants and animals).

DNR Waterfowl Feeding and Resting Areas

Given the absence of MNDNR Waterfowl Feeding and Resting Areas within or in close proximity to the Project Area, there are no potential impacts to MNDNR Waterfowl Feeding and Resting Areas as a result of the proposed project development. As a result, no mitigation measures are warranted for MNDNR Waterfowl Feeding and Resting Areas.

Important Bird Areas

Approximately 57% of the Project Area is within the Prairie Coteau IBA. The IBA is designated for grassland associated species in a landscape that is otherwise highly fragmented and dominated by agriculture (National Audubon Society 2017). By siting the repowering turbines in cultivated fields and designing the associated infrastructure to avoid or minimize impacts on the native plant communities, grasslands, wetlands, and streams, Lake Benton Wind II has designed the Project facilities to avoid and minimize impacts on avian grassland species of concern, including direct (mortality) and indirect (displacement, habitat loss and fragmentation) impacts.

8.19.6 Mitigation Measures

Lake Benton Wind II will implement the following measures to avoid potential impacts to wildlife and Rare and Unique Natural Features during selection of the turbine locations and Project development and operation:

- Avoid and minimize siting turbines in mapped native prairie, native plant communities, and MBS sites of biodiversity significance ranked moderate, high or outstanding;
- Maintain MNDNR recommended setback distances from WMAs, WPAs, SNAs and state parks to reduce risk to waterfowl and grassland-associated birds and butterflies when siting turbines in the Project;
- Avoid or minimize placement of turbines in high quality grassland or pasture areas that may act as native grasslands for breeding grassland bird and butterfly species;

- Avoid or minimize placement of turbines in previously undisturbed shrub/scrub vegetation types that may provide additional habitat for breeding birds;
- Protect existing trees and shrubs by avoiding tree removal for turbines, access roads and underground collector lines;
- Avoid or minimize disturbance of individual wetlands or drainage systems during Project construction. Wetland delineations and micro-siting of turbines will be conducted prior to construction to identify limits of wetland boundaries and to avoid placement of turbines in sensitive wildlife habitat;
- Lake Benton Wind II will prepare a prairie protection and management plan in consultation with the MNDNR;
- Should siting and construction plans change, and impacts to wooded habitat that is potential roosting habitat for northern long-eared bats cannot be avoided, additional activity and cutting restrictions may be warranted per USFWS 4(d) rule and will be conducted in consultation with USFWS;
- Maintain appropriate water and soil conservation practices during construction through the implementation of construction BMPs. These practices include silt fencing, temporary reseeding, permanent seeding, mulching, filter strips, erosion blankets, grassed waterways and sod stabilization;
- Topeka shiner related management minimization recommendations (USFWS-Twin Cities Field Office 2016) for the Big Sioux and Rock River Watersheds (approximately 47.7% of the Project Area) include (but are not limited to) the following and will be implemented as appropriate:
 - Do not dewater or temporarily divert streams for construction;
 - Do not conduct in-stream work before August 15 to avoid disrupting spawning;
 - Follow all applicable requirements and best management practices for stormwater permits from the MPCA;
 - Minimize removal of riparian vegetation;
 - Mulch areas of disturbed soil and reseed promptly;
 - Implement appropriate erosion and sediment prevention measures;
 - Ensure that erosion control features are in place;
 - Design and install instream structures (*e.g.*, box culverts) in a manner that will not impair passage of Topeka shiners after construction is completed;
 - Do not operate motorized vehicles instream;
 - Backfill placed in the stream shall consist of rock or granular material free of fines, silts, and mud; and
 - Prevent materials and debris from falling into the water during construction.
- Construct wind turbines using tubular monopole towers;
- Light turbines in accordance with FAA requirements;

- Coordinate with local NRCS staff to revegetate non-cropland and pasture areas disturbed during construction or operation of the wind facility with native seed mixes appropriate to the region;
- Inspect and control noxious weeds in areas disturbed by the construction and operation of the Project;
- Conduct Tier 4 post-construction monitoring in order to better understand bird and bat impacts that are attributable to the Lake Benton Wind II operation and adjust operations based on the level of mortality observed;
- Prepare and implement a Wildlife Conservation Strategy (WCS) during construction of the Project. The WCS incorporates the components of an Avian Bat Protection Plan (ABPP) and has been developed in accordance with the guidelines and recommendations set forth in the USFWS Land-based Wind Energy Guidelines (2012) and the Wind Turbine Guidelines Advisory Committee's Recommended Guidelines to the USFWS (2010). A draft WCS is attached to this Application as **Appendix J (Wildlife Conservation Strategy)**;
- Lake Benton Wind II is committed to minimizing avian and wildlife impacts within the Project and will implement measures to avoid and minimize impacts to sensitive wildlife species and habitat. Lake Benton Wind II continues to maintain communication with USFWS and MNDNR regarding appropriate mitigation measures for wildlife impacts.

9.0 SITE CHARACTERIZATION

9.1 Description of Resources

To simulate wind flow patterns for the Project site, WindLogics performed a detailed modeling process consisting of a mesoscale model to simulate the large scale weather patterns, as well as a wind flow model to resolve small scale terrain and land features. The model output was then adjusted to on-site conditions using meteorological data normalized to long-term climatic means using the WindLogics Enhanced Measure-Correlate-Predict (E-MCP) methodology.

In addition to a thorough meteorological analysis of the site, WindLogics used archived weather data resources and physics-based numerical simulations (weather models) to calculate wind flow patterns at the site for the year 2014. Further analysis was performed utilizing multiple long-term data points from the Modern-Era Retrospective Analysis for Research and Applications (MERRA2) data set as compiled by the National Aeronautics and Space Administration (NASA), which are processed together using the E-MCP method to estimate long-term characteristics of the wind resource. The results of the E-MCP processing phase provides a thirty-year normalized time-series, representative of the long-term wind distributions at the site, which is then applied to wind turbine manufacturer's turbine power curves. This combination of meteorological modeling and normalization offers the best available assessment of the long-term wind resource at the site.

One meteorological tower was used in WindLogics' analysis (4256). The data was collected in ten-minute intervals at the location for six years and five months. Based on the measured data, the overall average wind speed based on the turbine locations is 9.34 m/s (30.64 ft./s or 20.89 mph) at hub height.

9.1.1 Interannual Variation

Interannual variation is the variation in expected annual wind speeds over the timeline of the project. There is a strong correlation between the Lake Benton Wind II's meteorological tower data and the long-term reference data sets available through the NASA's MERRA2 reanalysis program. Based on the analysis of measured and model data in the project area, the annual variation of wind speed is expected to be approximately 0.08 m/s (0.02 ft./s).

9.1.2 Seasonal Variation

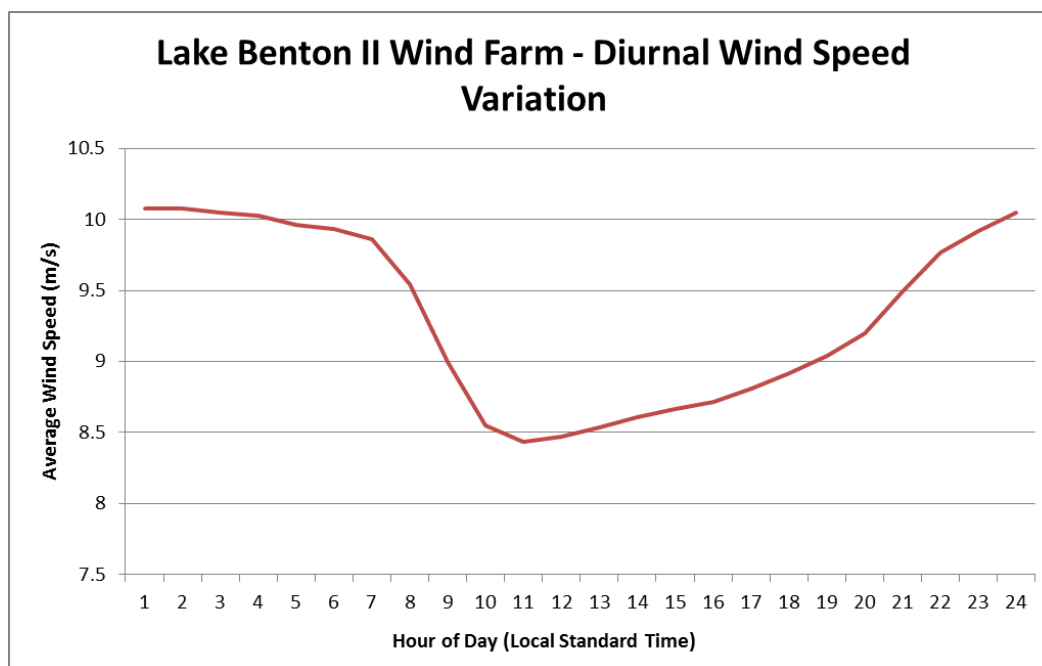
Seasonal variation is represented by the change in monthly wind speeds. Table 9.1.2 shows the estimated average seasonal variation based on long-term data. The months of November through April are expected to have the highest wind speeds, and the months of June through September are expected to have the lowest wind speeds.

Table 9.1.2: Average Wind Speed

Month	Wind Speed (m/s)
January	9.9 (32.5 ft./s)
February	9.6 (31.5 ft./s)
March	9.8 (32.2 ft./s)
April	9.9 (32.5 ft./s)
May	9.3 (30.5 ft./s)
June	8.5 (27.9 ft./s)
July	8.0 (26.3 ft./s)
August	8.0 (26/3 ft./s)
September	9.2 (30.2 ft./s)
October	9.7 (31.8 ft./s)
November	10.0 (32.8 ft./s)
December	9.9 (32.5 ft./s)
Annual Average	9.3 (30.5 ft./s)

9.1.3 Diurnal Conditions

Diurnal variation represents the changes in weather patterns over the course of a day. Figure 9.1.3 shows the variation in wind speeds at the Lake Benton Wind II Project Area. The wind speeds are typically higher during the evenings and lower in the mornings and afternoons.

Figure 9.1.3: Lake Benton Wind II Diurnal Wind Speed Variation

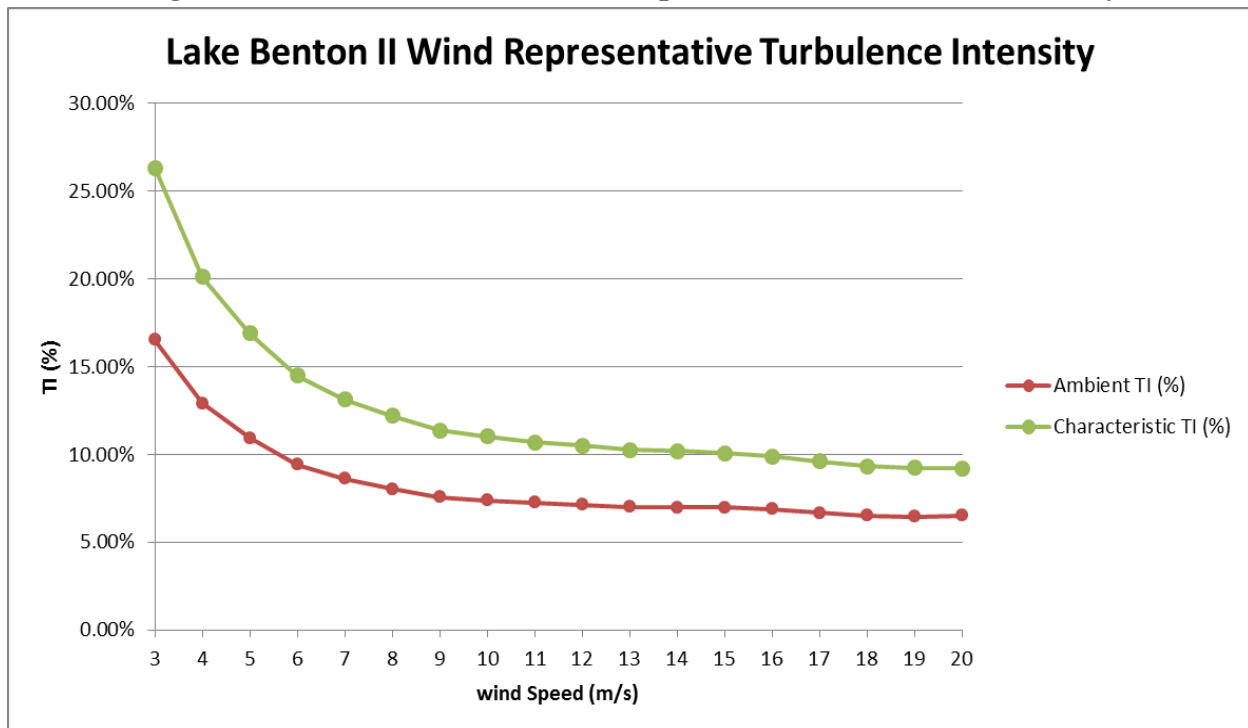
9.1.4 Atmospheric Stability

The thermal stability of the atmosphere fluctuates with respect to time of day, season, and instantaneous meteorological conditions. Generally, stability classes characterize the magnitude of vertical temperature gradient with unstable conditions associated with highly mixed atmospheric layer and stable conditions associated with stratified conditions. Among other things, atmospheric stability affects wind power production by dictating the amount of vertical wind shear. The thermal stability at Lake Benton Wind II is expected to be slightly stable based on on-site measurements and global reanalysis data.

9.1.5 Hub Height Turbulence

Turbulence intensity can be defined as the measured standard-deviation of wind speed over the mean wind speed for some time period. Turbulence intensity can be represented in wind speed bins. For 15 m/s (49 ft./s) wind speeds at Lake Benton Wind II, the ambient turbulent intensity at the site is 7.0% and the characteristic intensity is 10.1% at hub height (90m or 295 ft.). These measurements are based upon wind data measured from the meteorological towers present at the site. Overall, the turbulence intensity for the site is considered to be in the optimal range.

Figure 9.1.5: Lake Benton Wind II Representative Turbulence Intensity



These values are taken from 6.4 years of data at M4256 and are considered to be representative of the site. Overall, the turbulence intensity for the site is considered to be reasonable for the region and terrain.

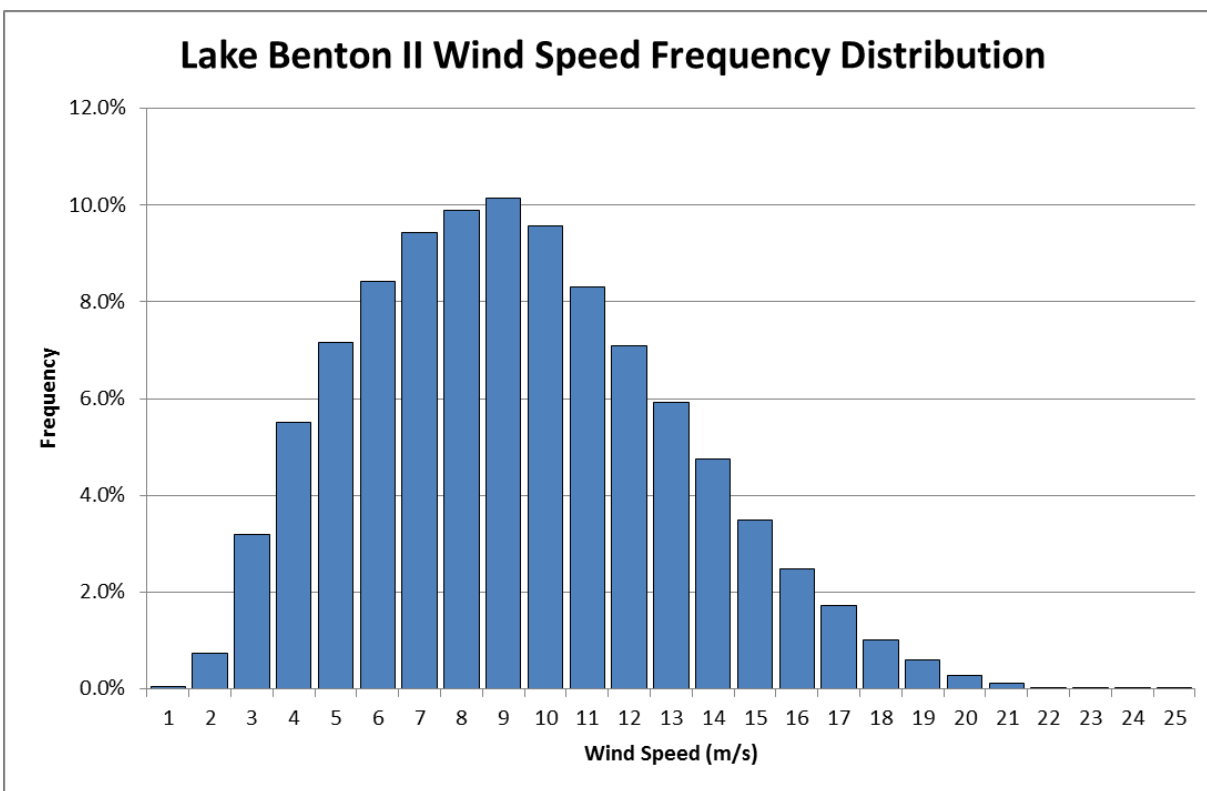
9.1.6 Extreme Wind Conditions

The maximum 10 minute average wind speed measured at the Lake Benton Wind II Project Area during the period of record was 25.8 m/s (84.7 ft./s). Long-term extreme winds were calculated at the site using a Periodic Maxima method and the Harris 1996 Gumbel-fit of the observed annual maximum wind speeds. Using this method, the maximum 50-year 10 minute mean wind speed and 3 second gust for Lake Benton Wind II are expected to be 30.7 m/s (23 ft./s) and 34.4 m/s (112.5 ft./s), respectively. These values are calculated from data collected from one meteorological tower spanning 6.5 years of measurements.

9.1.7 Wind Speed Frequency Distribution

Figure 9.1.7 provides the anticipated long-term annualized wind speed frequency distribution for the Lake Benton Wind II Project Area. The frequency distribution is calculated from one on-site meteorological tower and is normalized to the 25 closest grid points of the NASA MERRA2 dataset. A majority of the winds occur between 4 m/s (13 ft./s) and 14 m/s (45.9 ft./s).

Figure 9.17: Wind Speed Frequency Distribution at the Project



9.1.8 Wind Variation and Height

Wind shear is the change in wind speeds with increasing elevation. Wind shear is calculated using the power law equation based on the relative distance from elevation. The equation used for calculating wind shear is $v_2 = v_1 \left(\frac{z_2}{z_1} \right)^\alpha$ where v and z correspond to the wind speeds and heights at two levels and α is the shear coefficient. The shear coefficient can vary greatly due to geographical location and site site-specific characteristics such as terrain roughness, elevation, and atmospheric stability. Based upon data collected at the site, the representative wind shear at the site is 0.22.

Table 9.1.8: Lake Benton Wind II Measurement Speeds and Shears

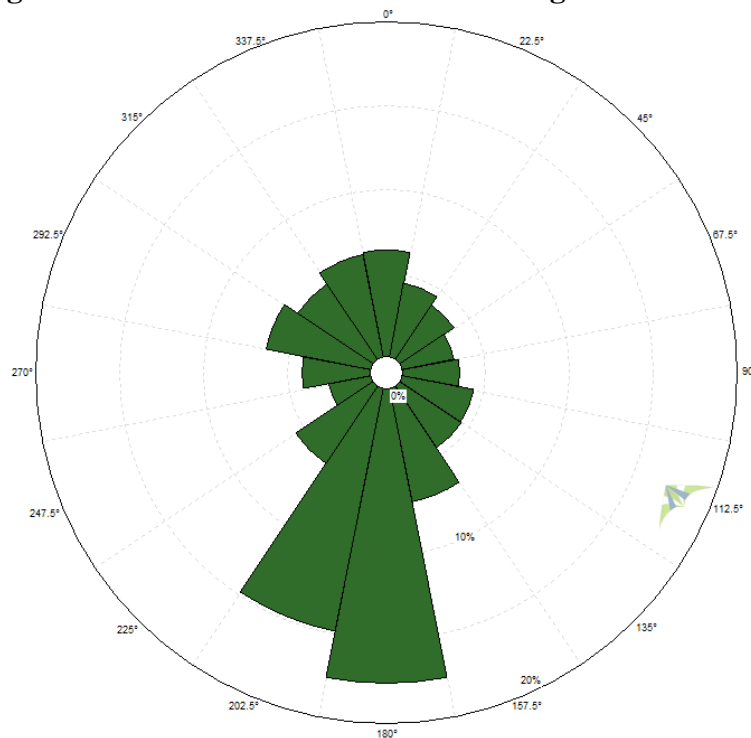
Met Tower	Short-Term 90m Wind Speed (m/s)	Long-Term 90m Wind Speed (m/s)	Overall Shear
4256	8.97 (29.43 ft./s)	9.28 (30.45 ft./s)	0.22

9.1.9 Spatial Wind Variation

As noted previously, the wind resource assessment is based on one metrological tower. The mean expected spatial variation in wind speed across the Lake Benton Wind II Project Area is between 8.9 and 9.5 m/s (between 29.2 and 31.2 ft/s) based on the turbine locations and their respective hub heights.

9.1.10 Wind Rose

A wind rose displays a graphical representation of the prevailing wind directions and wind speeds gathered from measured data. Figure 9.1.10 shows a representative wind rose from the metrological tower at Lake Benton Wind II.

Figure 9.1.10: Wind Rose from Meteorological Tower 4256

9.1.11 Other Meteorological Conditions

The proposed Project will undergo a Mechanical Loads Assessment performed by GE. The analysis takes into consideration terrain complexity, wind speed distributions, turbulence intensity, and other extreme weather and temperature conditions. Minnesota's winter climate presents significant risks factors of low temperatures and possible icing events. The average temperature at the proposed site is 7.9 C (46.22 F) with minimum and maximum temperatures of -35.8 C (-32.44 F) and 41.9 C (107.4 F). Each turbine is equipped with a cold weather package to mitigate hazards associated with extreme temperatures. The wind turbines will shut down at temperatures below -30.0 C (-22 F) and above temperatures 40 C (104 F) to mitigate the chances of catastrophic failures.

9.2 Other Nearby Wind Turbines

There are a total of approximately 155 identified wind turbines located within 5 miles (8 kilometers) of the Project Area. Based on data available through the FAA database, there are a number of existing commercial-scale wind projects located north, east, and south of the project area in Lincoln, Murray, and Pipestone counties (FAA, 2017). Northern Alternative Energy is located to the north of the Project Area and consists of approximately 24 wind turbines. Moraine Wind I and II are located east and south of the Project Area and consist of approximately 34 turbines each. Ridgewind Power Partners, enXco, and a number of small wind farms (Tholen,

McBeth, Boeve Windfarm, Fey Windfarm, K-Brink Windfarm, and Windcurrent Farm) are located south of the Project Area. Diversified Energy also has another turbine east of the Project Area.

10.0 PROJECT CONSTRUCTION

A number of pre-construction and construction activities will be completed to facilitate commercial operation. The majority of these activities relate to equipment ordering lead-time, as well as design and construction of the Project. The following provides a summary of key activities:

- Order all necessary components including towers, nacelles, blades, foundations, transformers, etc.;
- Finalize turbine microsites;
- Complete surveys to establish locations of structures and roadways;
- Complete geotechnical soil borings, testing and analysis for proper foundation design and materials;
- Complete construction of new access roads and upgrades to existing access roads to be used for construction and maintenance, and construct temporary roadway improvements;
- Construct collection and feeder lines and communication cables;
- Retrofit existing POI stations to replace aged infrastructure and accommodate new equipment;
- Install tower foundations;
- Place towers and set wind turbines;
- Complete Project backfeed and testing; and
- Commence commercial operation.

As an initial step in Project construction, land will be graded where above-ground project infrastructure will be installed including areas for the turbine pads, culverts, access roads, the O&M building and additional facilities, as necessary. Grading may also be employed at a temporary laydown area. Typically, from the time grading begins the physical construction of the facility takes approximately 5 to 7 months for turbines to be erected and commencement of the reclamation process.

During construction, water and chemical applications are applied to roadways and construction areas for dust abatement. In high traffic areas, chemical applications, such as calcium chloride can be used to suppress dust. The use of chemical applications is confirmed via coordination with road authorities during the development of road use agreements. Water is typically applied in front of residences that are located along haul routes or that are in proximity to construction areas. Water is routinely and proactively applied in higher traffic and near residences so as to mitigate dust during construction.

During grading and excavation, top soil is removed, typically to a depth of 8 to 12 inches, depending on local soil conditions. Topsoil is stockpiled for use during restoration and reseeding as discussed in Section 10.5. In areas where excavation occurs, excavated soil is piled to heights of approximately 6 feet or less.

10.1 Roads and Infrastructure

During construction, temporary roadway improvements are anticipated on some public roads within the Project Area. Existing state, county, and township roads will be used for the transportation of equipment, construction materials and personnel to and from and within the Project Area. Final turbine and Project infrastructure layout, impact analyses, land owner requests, feedback from roadway jurisdictions, and other factors will assist the Applicant in determining which existing roads will be used for Project construction activities and what upgrades or maintenance may be required. Temporary roadway improvements will be installed along specific routes as necessary to facilitate the movement of equipment. There will be turning radii installed at various intersections to allow for turbine component deliveries. The Applicant will coordinate with the State, counties, and townships, as applicable, regarding the planned use of haul routes that may require road improvements or traffic control measures during the construction period and to ensure that any overweight permits, road use permits, road maintenance agreements and other approvals are secured.

During construction, the Applicant will perform routine maintenance and roadway repairs associated with upkeep needed or damage resulting from the Project activities.

10.2 Access Roads and Crane Paths

Access roads are necessary to connect the public roadway network to each turbine location. A total of approximately 13 miles (21 kilometers) of access roads will be necessary and permanent roadways will be gravel roads approximately 16 feet (5 meters) wide. New access roads will be constructed and some existing access roads from the existing Lake Benton II project will remain in place to be utilized and upgraded as appropriate for the proposed Project. Approximately 6.5 miles (10.5 kilometers) of new access roads are anticipated and 6.7 miles (10.8 kilometers) of existing access roads will be used. Actual final lengths of access roads will be determined by final turbine road layout, environmental constraints, land owner requests and other factors. After construction is complete, a gravel roadway approximately 20 feet (6 meters) wide will be installed around the base of each turbine so as to facilitate driving around turbine bases.

The typical cross section of access roads will be dependent on terrain, grade, and drainage considerations. Access roads may incorporate geotechnical fabric and cement stabilization measures beneath the aggregate roadway cap.

The installation of access roads may require gates, fences, or other existing landscape modifications to change. Modifications will be discussed with the landowners and gates and

fences will be repaired, replaced, or reconfigured, as needed and in coordination with the landowner. Lake Benton Wind II will work with landowners to ensure the location of access roads minimize adjacent land use disruptions to the extent practicable. Access roads will include appropriate drainage and culverts as necessary and permits for drainage and culvert installation will be obtained as required.

To facilitate crane movement and equipment delivery during construction, crane pathway locations will be finalized based on final turbine and road layout, landowner requests, avoidance of environmental constraints such as wetlands, sites of biological significance, prairies, sensitive habitat, and other factors.

Temporary roadways during construction will be installed to a maximum of 40 feet (12.2 meters) in total width. Access roads widened for crane paths and equipment deliveries will be reduced to their permanent width of approximately 16 feet (4.9 meters) upon completion of construction. Where temporary installations are removed, areas will be graded to natural contours, soil de-compaction and re-seeding will occur as described further in Section 10.5.

10.3 Associated Facilities

The Project will include construction of an O&M facility, installation of up to two (2) permanent MET towers, and an electrical collection system. The electrical collection system connecting the turbines to up to four POI stations will be installed underground at a minimum depth of 48 inches (122 centimeters), which is a sufficient depth to accommodate existing agricultural land use practices aboveground. Crossings at streams, railroads, roads, and other features where necessary, will be managed via directional-drilling beneath features. Directional drilling will include installation of conduit casings through which three-phase electrical cabling and fiber optic lines will be run. The collection system's electrical layout will require occasional aboveground features, including junction boxes, pad-mounted transformers, and cross bonding cabinets, all of which will be located on participating landowners' properties once adequately surveyed for environmental, cultural, and other considerations.

In addition, a temporary laydown area will be established for construction parking, equipment storage, and temporary office trailers. A concrete batch plant will be temporarily established at the laydown area or O&M building if necessary, to provide concrete production during construction. Areas used temporarily during construction will be restored in conjunction with post-construction clean-up.

10.4 Turbine Site Selection

10.4.1 Foundation Design

It is anticipated that the freestanding tubular wind turbine towers will be erected on reinforced concrete spread footing foundations. The bearing surface of the foundation will be at a depth up

to 12 feet (4 meters), with a width of up to approximately 68 feet (21 meters). The tubular steel tower will be connected to the concrete foundation through a base plate and high strength anchor bolts embedded in the concrete foundation. Approximately 35 tons of steel will be required in the rebar design of the foundation for structural support. The concrete turbine foundations will require up to approximately 2,400 cubic yards of excavation depending on soil requirements and turbine size. The installed foundation concrete is anticipated to be up to approximately 600 cubic yards (459 cubic meters) of material. Geotechnical data, turbine loads, and costs considerations will dictate the final design of the foundation at each site. Excavated soil will be used for backfill once turbine foundations are installed. Areas around the turbine are graded so that drainage will flow away from the base of the turbine. Excavated soil is also used in the construction of roads and is spread across construction areas as discussed further in Section 10.5.

10.4.2 Tower

The construction of the wind turbine towers will be modular, with individual components arriving at the site pre-fabricated. The majority of on-site assembly will consist of bolted connections and electrical wiring. Once the foundations are cured in the ground, two mobile cranes will be utilized to stack tower sections on the foundation and place the nacelle atop the completed tower assembly. The rotor (consisting of hub and blades) will then be assembled on the ground and picked up as a single unit to be bolted to the nacelle. At this point, tower crews will work within the tower to ensure all mechanical and electrical connections are completed to facilitate energization.

10.5 Post-Construction Cleanup and Site Restoration

Following the installation of turbines and the turbine being mechanically complete (fully erected), gravel driveways will be placed around the base of each turbine and left in place permanently. All temporary road radius improvements and temporary culverts will be removed and restored as turbines become mechanically complete. For any section of state, county, or township road used as a haul route, the roadway will be restored to its pre-construction state or better, as negotiated from road use agreements. This may consist of re-grading, re-paving, enhancing the shoulder of the road or enhancing the segment of roadway in a manner agreed upon by the Applicant and the responsible road authority.

Areas temporarily disturbed by construction activities will be re-graded to original contours. Excavated soil will be used as backfill, will be used in the construction of access roads, and remaining soil will be spread over temporary construction areas. Where excavated soil is spread and grading occurs, topsoil will be placed atop the excavated spoils and the areas will be revegetated. In areas where soil compaction occurred from construction activities, areas will be ripped up with a grader to decompact the soil. These areas will then be topped with topsoil and will also be revegetated.

Restored temporary construction areas will be reseeded unless the area is in a tillable agricultural field. Reseeded areas will be monitored to confirm that the seeding results in revegetation. Additional seed will be applied as necessary. Storm water BMPs, such as silt fence and straw wattle, will not be removed until at least 70% revegetation/regrowth has occurred, unless the area is in a tillable agricultural field. If the area is in tillable agricultural field, a cover crop will be planted to minimize soil loss.

10.6 Operation and Maintenance of Project

As explained in Docket No. E-002/M-16-777, Lake Benton Wind II is a build and transfer project. Thus, the Project will be transferred to NSP on the commercial operations date. O&M of the Project will be conducted by NSP consistent with the applicable North American Electric Reliability Corporation Reliability Standards. NSP will be responsible for maintenance and operations of the project upon final turnover. There will be 24 hours per day, 7 days a week operational monitoring of the Project through SCADA. During operations, the O&M crew will be comprised of approximately 7 to 12 primary staff who largely will be wind technicians (*i.e.*, technicians who carry out the maintenance on the turbines) along with a site supervisor. These workers will work out of the Project O&M building.

Turbines and the substation are monitored remotely by an O&M contractor 24 hours a day at the O&M Contractor's monitoring center and faults are reset when possible to ensure high turbine availability. Wind technicians are called out on non-resettable faults based on time of day and wind conditions. Certain turbine data is monitored for abnormalities at a NSP Maintenance and Diagnostic Center in Denver, Colorado. Engineers also provide performance and reliability optimization using various methods and replicate best practices across the fleet.

Maintenance is performed on a combination of time based and predictive maintenance schedules and is modified as needed based on engineering decisions. Scheduled time based turbine maintenance is performed on lower wind days whenever possible to maximize site output on high wind days. Substation and collection system maintenance is scheduled in the summer during low wind periods. Spare parts are kept on site to address long lead times, and frequently used items are kept to ensure failed equipment is returned to service as quickly as possible.

10.7 Costs

The Capital Expenditure for the Project is estimated to be approximately \$170 million. This includes all costs of development, design, and construction. General costs associated with project operation, maintenance, initial spare parts, operating equipment, and operating supplies is estimated to be approximately \$140,000 for the first year and is estimated to be an average of approximately \$3.3 million per year for the following 24 years (assuming 25-year depreciation).

10.8 Schedule

Consistent with the terms of the agreement with NSP, the anticipated date of commercial operations is September 2019. The following schedule sets forth the milestones needed to meet the agreed on commercial operations date.

Table 10.8: Project Schedule

Activity	Estimated Completion
Site Permit Order	January 2019
Notice to Proceed	March 2019
Construction	Q2-Q3 of 2019
In-Service Date	September 2019

10.9 Energy Projections

A net capacity factor of approximately 49.5 to 57.5 percent is expected annually. The projected average annual output of approximately 469,685 MWh is anticipated for the Project.

10.10 Decommissioning and Restoration

10.10.1 Anticipated Life of the Project

The Project is expected to have an operational life of approximately 25 years.

10.10.2 Estimated Decommissioning Costs in Current Dollars

A site decommissioning estimate for the Project indicates that decommissioning will cost approximately \$47,000 to 48,000 per turbine.

The decommissioning estimate includes the following assumptions:

- Decommissioning of turbines and towers estimates include dismantling of turbine components and transporting off site.
- Deduction for salvage value of the components.
- Tower foundations, transformer foundations, conduits and collection system would be removed to a depth of at least four feet (1.2 meters) below existing grade.
- Foundations at each site would be graded to match surrounding contours and restored to conditions that will support surrounding vegetation.
- All aggregate base roads would be scarified, loaded and removed from site to a location (within 10 miles (16 kilometers) roundtrip). The remaining subgrade would be de-

compacted and graded to match existing and natural grade. The area would then be re-established to conditions to support the surrounding vegetation.

- Removal of the electrical collection system would include the removal of termination sections near transformers to a depth 48 inches (122 centimeters) below the existing ground line.
- After dismantling and excavating the facility, high value components will be removed for scrap value. The remaining materials will be reduced to transportable size and removed from the site for disposal. Materials will be disposed where disposal is permitted and where there is capacity for the disposal.

10.10.3 Method of Ensuring that Funds are Available for Decommissioning

The Permittee will submit a decommissioning plan to the Commission at least fourteen (14) days prior to the pre-operation meeting, and provide updates to the plan every five (5) years thereafter. The plan will provide information identifying all surety and financial securities established for decommissioning and site restoration of the Project in accordance with the requirements of Minn. R. 7854.0500, subpart 13.

10.10.4 Method for Updating that Funds are Available and Updating Decommissioning Costs

Over the life of the Project, funds to cover decommissioning costs will be maintained. Lake Benton Wind II has a contractual obligation with landowners for remediation of the properties back to a condition comparable to that of the property prior to the installation of the wind project.

10.10.5 Anticipated Methods of Site Decommissioning and Restoration

A decommissioning plan will be submitted at least fourteen (14) days prior to the pre-operation meeting that will provide an itemized breakdown of costs of decommissioning all project components, which will include labor and equipment. The plan will identify cost estimates for the removal of turbines, turbine foundations, underground collection cables, access roads, crane pads, substation(s) and other project components. The plan may also include anticipated costs for the replacement of turbines or repowering the project by upgrading equipment. This plan will be implemented at end of the Permit term, unless the Applicant requests and is granted a longer or renewed term by the Commission.

As an overview, the decommissioning plan will include, but will not be limited to, the following:

- Removal of the turbine, tower, infrastructure and foundation to a level of 48 inches (122 centimeters) below grade and return the grade to a condition comparable to conditions prior to the construction of the Project.
- Turbine disassembly would be accomplished using large cranes similar to those used for installation. Components would be removed in reverse-order of installation, and placed

either directly onto trucks for removal from the Project, or onto the ground near the turbine base for eventual loading onto trucks.

- Tower sections would be lowered to grade and cut into transportable sections for delivery to a scrap metal purchaser. Control cabinets in the base would be stripped of high value components and the balance turned over to a scrap company for haul and disposal. The options for wind turbine recycling are evolving and are expected to be very different at the time of Project decommissioning than they are currently.
- Foundations would be exposed using backhoes, bulldozers and other heavy earth moving equipment. Turbine foundations would be excavated to a depth sufficient to remove all anchor bolts, rebar, conduits, cable and concrete to a depth of 48 inches (122 centimeters) below grade. After removal of all noted foundation materials, the areas would be filled with clean compatible sub-grade material compacted to a density similar to the surrounding sub-grade material. All disturbed areas will be restored to pre-existing conditions and contours.
- Above-ground elements of the collection system, such as the, junction boxes, and pad-mounted transformers would be removed and the materials would be disposed, recycled, or sold. Environmental and agricultural impacts are minimized by leaving the underground cables in place. The electrical collection system is primarily an underground facility, therefore, decommissioning of the facility would be minimal.
- To perform the decommissioning activities, it may be necessary to return some roads to their construction stage widths. This would allow for efficient crane access to the turbine sites and facilitate removal of the wind turbine components by truck. A road survey will be conducted to determine the condition of the roads prior to work decommissioning activities. During the decommissioning process, where necessary, roads will be cleared, compacted, graded and maintained. Once decommissioning has been completed, the roads will be removed and reclaimed, unless the underlying landowner requests otherwise. This would likely include the removal of aggregate and any unnecessary culverts, de-compaction of the road base, and re-contouring of larger cuts and fills.

Restoration activities would also include, but not be limited to, the following:

- Topsoil would be removed prior to removal of structures from all work areas and stockpiled and separated from other excavated material. The topsoil would be de-compacted to match the density and consistency of the immediate surrounding area. The topsoil would be replaced to original depth and original surface contours reestablished where possible. Any topsoil deficiency and trench settling shall be mitigated with imported topsoil consistent with the quality of the affected site.

- All disturbed soil surfaces within agricultural fields would be seeded with a seed mix agreed upon with the landowner in order to maintain consistency with the surrounding agricultural uses. All other disturbed areas would be restored to a condition and forage density reasonably similar to surrounding conditions at the time of decommissioning. In all areas restoration will include leveling, terracing, mulching, and other necessary steps to prevent soil erosion, to ensure establishment of suitable grasses and to control noxious weeds and pests, as required.

11.0 IDENTIFICATION OF OTHER POTENTIAL PERMITS

The Applicant identified in Table 11 known or potentially required permits, reviews, and approvals for the Project.

Table 11: Other Potential Permits, Reviews and Consultations

Regulatory Authority	Permit/Approval
<u>FEDERAL</u>	
Federal Aviation Administration	<ul style="list-style-type: none"> • Form 7460-1 Notice of Proposed Construction or Alteration (Determination of No Hazard) • Form 7460-2 Notice of Actual Construction or Alteration
Federal Communications Commission	<ul style="list-style-type: none"> • Non-Federally Licensed Microwave Study • NTIA Communication Study
U.S. Army Corps of Engineers	<ul style="list-style-type: none"> • Clean Water Act Section 404 coordination (General or Nationwide permit if required)
U.S. Fish and Wildlife Service	<ul style="list-style-type: none"> • Informal coordination under Section 7 of the Endangered Species Act
Environmental Protection Agency (region 5) (EPA) in coordination with the Minnesota Pollution Control Agency (MPCA)	<ul style="list-style-type: none"> • Spill Prevention Control and Countermeasure Plan
U.S. Department of Agriculture	<ul style="list-style-type: none"> • Informal consultation if required for properties in Conservation / Grassland / Wetland Easement and / or Reserve Programs
<u>STATE</u>	
Minnesota Public Utilities Commission	<ul style="list-style-type: none"> • Site Permit for Large Wind Energy Conversion System
Minnesota Department of Labor and Industry	<ul style="list-style-type: none"> • Electrical Plan Review, Permits, and Inspections
Minnesota State Historic Preservation	<ul style="list-style-type: none"> • Informal SHPO coordination for Cultural and Historical resources review including State and

Regulatory Authority	Permit/Approval
Office (SHPO)	National Register of Historic Sites review
Minnesota Pollution Control Agency	<ul style="list-style-type: none"> • National Pollutant Discharge Elimination System/State Disposal System Permit (NPDES/SDS) – General Storm Water Permit for Construction Activity • License for a Very Small Quantity Generator of Hazardous Waste • Spill Prevention Control and Countermeasure Plan • Aboveground Storage Tank Notification Form • Clean Water Act Section 401 Water Quality Certification • NPDES and SDS General Permit MNG490000 for Nonmetallic Mining Operations and Associated Activities
Minnesota Department of Health	<ul style="list-style-type: none"> • Environmental Bore Hole approval for subsurface geotechnical studies • Plumbing Plan Review if required for O&M building • Water Well Permit if required for O&M building
Minnesota Department of Natural Resources	<ul style="list-style-type: none"> • Informal coordination for Endangered Species Statutes • Coordination on a Wildlife Conservation Strategy • General Permit for Water Appropriations, Dewatering • Native Prairie Protection Plan • Wetlands/Waters coordination for Public Waters Work Permit and/or License to Cross Public Lands and Waters
Minnesota Department of Transportation	<ul style="list-style-type: none"> • Oversize/Overweight Permit for State Highways • Access Driveway Permits for MnDOT Roads • Tall Structure Permit

Regulatory Authority	Permit/Approval
	<ul style="list-style-type: none"> • Utility Access Permit
<u>LOCAL</u>	
Pipestone County	<ul style="list-style-type: none"> • Building Permit for O&M • Laydown Yard Conditional Use Permit • Roadway Access Permit • Drainage Permit • Working in Right-of-Way Permit • Overweight/Over-Dimension Permit • Utility Permit
Pipestone County Soil and Water Conservation District	<ul style="list-style-type: none"> • Wetland Conservation Act Approvals
Townships	<ul style="list-style-type: none"> • Right-of-way permits, crossing permits, road access permits, and driveway permits for access roads and electrical collection system, as needed
<u>OTHER</u>	
MISO	<ul style="list-style-type: none"> • Turbine Change Study • Generator Interconnection Agreement

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